

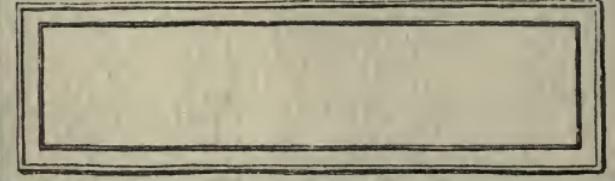
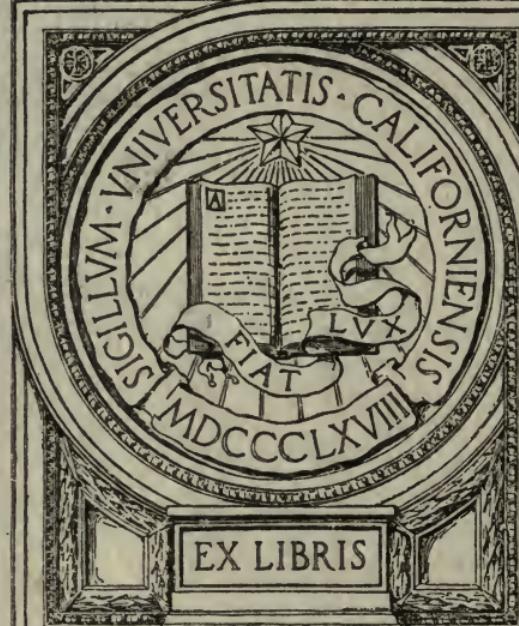
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Cost Keeping Short Cuts



A Cost Department where it is recognized that a clerk's time is worth money

Cost Keeping Short Cuts

Prepared from
Experiences in Many Lines
of Business

Illustrated



Detroit, Michigan, U. S. A.
BURROUGHS ADDING MACHINE COMPANY
1911

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1911

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40 VERSO
ADDITIONAL

Arranged, Written and Illustrated by the Departments of Systems
Service and Advertising

To the Business Man
Who Wants to Know the True Value of Anything
He Does or Buys or Sells, this Little Book
is Respectfully Dedicated

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Here again I would venture to utter a word of caution to business men. Let them study their own affairs frankly, and face the truth. If their methods are extravagant, let them realize the facts and act accordingly. One cannot successfully go against natural tendencies, and it is folly to fail to recognize them. It is not easy for so impressionable and imaginative a people as we Americans are to come down to plain, hard facts, yet we are doing it without loss of self-esteem or prestige throughout the world.

JOHN D. ROCKEFELLER.

BY WAY OF INTRODUCTION

THE first edition of COST KEEPING SHORT CUTS was issued not quite a year ago in response to what we believed to be a well defined interest among business men in cost finding. That our belief was well founded in fact has been verified by the cordial reception given the book and the rapidity with which our supposedly ample supply has been exhausted. Requests for copies poured in from all quarters, making this second edition necessary within nine months of the first. We have taken advantage of the reprint to correct a few errors which crept into the first edition, as well as to amplify the book where experience has shown such amplification necessary or valuable.

The merit of COST KEEPING SHORT CUTS has been well attested by the number and warmth of the appreciations coming to us through the mails. Perhaps the greatest compliment paid the book, however, has been its adoption by a number of schools and colleges, including one of the leading universities as an authoritative text book on costs, as well as by the successful application of its principles by a large number of manufacturers. If the second edition continues to receive the same degree of favor and proves of the same value to its readers, we shall be more than repaid for the expense of its production.

The whole matter started some time ago when we were asked to make a special machine for a manufacturer who thought it took too much time to handle his cost figures by hand. We studied his conditions. We made him a Burroughs machine which got so much greater efficiency at such a reduction in cost, that we were led by his enthusiasm to further investigate the whole subject of cost finding.

We had not gone far before we found several very surprising things:

- (a) That American business men were just beginning to be interested in costs.
- (b) That they apparently were not much beyond the inquiry stage.
- (c) That the practical information on the subject of cost finding was both meagre in quantity and questionable in authority.

From among thousands of good friends, users of our machines, without whose suggestions this book would have been impossible, we, however, obtained much useful experience data. An often repeated suggestion to "go ahead and get other experiences and then let us also have the benefits," caused us to arrange the material in form for publication.

This book is the spoil of that little journey into Cost Land.

Theory, in its objectional sense, has but little place in what follows. The offerings are hot from the crucible of everyday business practice.

One word, particularly to the technical reader. You will find this book fundamental and elementary. It is our aim to have it so. We hope you will find, however, what we have tried earnestly to put here—a few helpful suggestions.

If you find that it awakens inquiries and questionings that you would like to have answered, will you not write us fully?

We may not be able to answer everything you ask. We are not cost experts.

It may be, however, that we can send you a form or an experience that so nearly fits your problem that you will feel repaid for your trouble in writing. Certainly we shall be glad to be of such service to you.

BURROUGHS ADDING MACHINE COMPANY,
DETROIT, MICHIGAN.

May, 1911.

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W. F. Burroughs

Born, January 28th, 1858. Died, September 14th, 1898
The Inventor of the Burroughs Adding and Listing Machine

CHAPTER I

The Profits Made by Savings

NOT long ago a keen-minded writer on business subjects said, "During the next few years some of the tidiest profits in American industry will be saved out of operations. Heretofore, much of our profit has been made. But saving profit is a different thing altogether."*

That is the keynote of the remarkable interest in manufacturing and cost of production systems, which has appeared since 1905.

A nation of born salesmen and advertisers, we have heretofore solved the problem of making more profits by getting more sales. Competition has now forced us to realize that an increase of advertising and selling expense will not continue to increase the business in direct proportion to the increase of expense.

The corner grocery-man who some morning finds a competitor on the opposite corner is forced to realize the introduction of a new element. The new arrival advertises and employs the best salesmen and prices his goods at less. The old grocer finds his old trade gradually slipping away.

Such conditions must be met not only by advertising and good salesmanship, but he must go a step further.

It means better systems of bookkeeping, closer inventories, more careful checking of every item of income and outgo, more accurate methods of knowing what each clerk produces—in short the old grocer must decide to know what it really costs him to sell a peck of potatoes, in order to make the right price.

The same principle rules business in all lines. Cost, more than price, fixes profits. The public fixes the price it will pay. The dealer may keep it high, but the public fixes the limit, low or high, of what that price will produce.

* James H. Collins, "The Easiest Profits," Saturday Evening Post, March 26, 1910.

Profits
Made by
Savings The merchant may cut his cost as far as his ingenuity, and his manufacturing or merchandising ability will take him. He can only make the difference between what the public will pay and what he saves on the costs.

So vital a thing as keeping the cost and the price as widely separated as possible, would seem to call for the best thoughts of the most expert business man.

But it hasn't.

In fact the whole subject of costs is a wilderness of figures filled with more or less significant facts, which, to the average American business man, cost too much to catch.

Balance
Sheet
Prices Many manufacturers depend on their balance sheets to determine cost, and their competitors to fix price. This is guesswork of the rankest, most treacherous and deceiving sort. Even the street fakir selling collar buttons knows what his costs are, and in that respect knows more than some large enterprises who really know surprisingly little about how much it costs to put their output down at the point of final delivery.

Many a retailer doing a business of \$50,000 a year will tell you that "a cost system is only for manufacturers."

The wholesaler and jobber thinks of costs in a lump sum as expenses in his balance sheet.

Another manufacturer calmly works out his business plans on general assumptions of facts about what his product costs him.

It has been well said that the average business executive fails to get more than a small fraction of the vital facts and statistics that he should have to intelligently control the activities of a business.

The desire to dodge the expense of the necessary system that will bring such vital statistics to the executive desk has created this condition.

Any efficient accounting system should be an orderly and logical arrangement, by simple processes, of the facts

and figures of a business, so that it may concentrate into clear and concise statements a complete expression of the activities and condition of that business.

Contrary to the somewhat prevalent idea, there is no inherent complexity in system, just because it is a system. It may, however, be suggested that the observance of any logical routine in the handling of business is so repugnant to the training and style of some business men that they take refuge in the absurdity that "all system is red tape"—with the often painful result that they fail without knowing why, therefore being denied the important lesson their failure could have taught a man with a more analytical mind.

That this attitude on the part of business men is too general and often fatal, is generally conceded by those whose occupations such as bankers, lawyers, judges, expert accountants, referees in bankruptcy, etc., bring them into close contact with the facts and figures side of business troubles or failures.

How many retailers and wholesalers and even manufacturers have to wait for their yearly or half yearly inventory to find out if they have made or lost money? How often has this found them in a position where it was too late to do anything but call in their creditors.

No less an expert on costs than Mr. J. L. Nicholson* said in his interesting work on the subject of costs: "In the majority of enterprises to-day, the profits and losses are only known at the end of the regular fiscal period, when an inventory is taken and the books closed; and even then the result is not necessarily correct, inasmuch as the accuracy depends entirely upon the correctness of the inventory, which there is no means of checking or verifying in the ordinary systems. The result, whatever it may be, appears in the books of accounts for the entire period in one amount, and admits of no verification due

Profits
Made by
Savings

A Fatal
Attitude

* "Nicholson on Factory Organization and Costs," pp. 8 and 9.

Profits to the principle involved. There are two important
Made by Savings questions that relate to this: First, are the results apparently satisfactory; second, are they a disappointment, and a surprise? Let us take up the first question by asking one. Should a result in gross which is apparently satisfactory be accepted without question? A careful analysis of this will result in the answer, No. There is absolutely nothing in the profits shown in this manner to indicate whether the results should not have been considerably more. There may be many articles made at a loss, with the result that the articles upon which there is a good margin of profit have been paying the losses resulting from the sale of the other class of products. In taking up the second question, the first query that arises naturally would be: What am I going to do about it? There is only one way to correct the fault, and that is to locate it; and if the mass of detail that enters into the production of any plant is buried, owing to a lack of records dealing with the component parts of the product during the period of six to twelve months before results are obtained, this would indicate that some action is necessary in providing a plan that will admit of locating or determining the cause."

Touching on a similar condition of the business mind another writer recently said in a popular magazine: "The business world is of three different opinions on this subject of cost accounting, two of them wrong and the third right.

"One type of manufacturer operates with little cost accounting other than his annual inventory, and maintains that a cost system entails too much trouble and expense. From him one hears the familiar joke about Smith's cost system: 'Smith had experts working three months installing a cost system at his plant, and since then he's been busier working the system than making goods. Why, it costs him more to find out what his product costs him than it does to make it! Ha, ha!'

“The second type of manufacturer is Smith, who has actually become so absorbed in cost accounting that he is trying to make its smallest refinements practical. In many a mill Smith has been known to bring in experts to find out exact costs on a small job, spending more for the purpose than he made in profit.

“The third kind of business man is the one who strikes a safe middle course, taking what the cost experts have to give him and applying it in the light of his own practical knowledge. A little cost accounting and a little common sense make a combination hard to beat.”

To steer a middle course between the extremes of the impractical system visionary who strives to operate a business on hard and invariable lines as a machine is operated, and the stone blind “practical” man who never does anything unless it is mouldy with precedent, is, indeed, a hard but a necessary thing to do.

It is believed that the German was the first business man to understand that cheapening the cost of production opened the avenue to a greater and more profitable business.

The old idea was to keep our methods a secret, on the general assumption that the things hidden from a competitor were the things that made us big and successful.

The idea of overcoming competition was to have so much capital that we were able to lose a lot more money than the competitor could afford to. If anybody got into competition with us, the process was to freeze him out by standing the loss longer than he could.

This was before the science of accounting was applied to the matter of men’s labor; before we realized that time was money, that materials were money. Just as soon as we grasped the idea that if we had more time we could make more money, we started in to cut down the amount of time we had to give to any one particular part of our work by getting more out of the time. We could then sell

Profits the product more cheaply because we had put less time
Made by Savings (money) into it. We commenced to use labor-saving
machinery because it was time-saving machinery, which
meant money-saving machinery.

This was theory that worked.

Theory! All theory is generally the product of experience and
it in turn produces experience, a sort of an endless chain.

It is an interesting speculation to figure out how cost
accounting came into use. No doubt some man had a
theory that, if he kept books with himself—not only with
his customers, but with the various parts of his business,
with all his workmen, with his materials, his machines
and his salesmen, that he would better know what he was
doing.

Some men are frank enough to admit that they don't
really know what they are doing.

On the one side, our man put down all that workman
did, and on the other, he put down all the man cost him.
At the end of the year, six months, or every month, he
could cast it up and see whether he was getting what he
was paying for and whether that workman was making a
profit for him.

He kept books with the raw material that he bought.
He found what raw material cost and where it went.
Then he found what it cost to manage the men and the
materials. Cost of management was important.

If every workman could be trusted to do his work well
without oversight, he wouldn't need to have an overseer
or foreman, but as every workman has to have a certain
amount of oversight, the employer said, "Here, I will
distribute that cost of oversight to each man according to
his importance on my payroll. If he makes \$5.00 a day
and it requires \$1.00 worth of oversight, I will debit that
dollar against his account."

"This also applies to the amount of material he uses.
I'll sell the material to the workman at cost."

After he introduced this idea of keeping books with himself and with his men, he found that while most of the men were paying him, a few were not. He began to drop the unprofitable men and put in better. His standard was simple: If a \$5.00 man over there was producing good work at a profit, he made the \$5.00 man over here work up to the other fellow's standard. Before he knew it he had the whole factory working up to a higher pitch. That was one of the Cost Findings.

It was but a step to the idea that he should keep books with his lines of production. He soon found that it took a lot of money to sell certain lines. The margin was small and he found other lines were more profitable. The result was he cut down the production of the unprofitable and increased the production of the profitable. Then he saw no good reason why he shouldn't keep books with his heads of departments and his salesmen. And so all along the line he got in touch with the real meanings of the activities of his business.

Some day he will apply the cost idea to his clerical and accounting department.

But he had found where the minutes went and it didn't take him long to realize that as his Cost System gave him facts and figures about the activities of his business, he was fighting competition with his eyes open. He knew what he could do.

All of this required system—a system which needed the people who operated it to be in sympathy with the things he wanted.

At the very beginning it is well to forget all about the idea that "our business is different." We find that there are time and material and indirect expense in every manufacturing business. It doesn't make any difference whether we make candy cones for the school children of New York, or locomotives for the Siberian railway. The

Keeping
Books
With
Himself

Forget
the
Idea

Profits whole necessity lies in tracing the time, material and
Made by Savings indirect expense which make up the cost of doing business.

Just as soon as we forget that "our business is different" we begin to find out how other people do their work; how other people find what it costs them to do business. That is where we are to-day—we are seeking more light on the subject.

Tearing away all the fine spun theories of the professional, the fact is, having pushed price to the limit of the public acceptance, greater profits now lie behind us, in pushing costs down to the point where quality and quantity of production begin to be affected.

That is the whole philosophy of cost keeping in a sentence. Many men think the application of the principle should be equally simple—but it isn't and it can't be.

All the complications come in when we come to trace the course of a dollar's worth of material through two hundred and fifty hands and one hundred and ten operations, to the completed article.

But this complexity in turn, actually works out in expert hands, into some very simple system of records, as will later be shown.

Cost accountants sometimes turn up most unusual and surprising conditions in exceptionally reputable and apparently well-regulated business households.

A Printer Found Out

A printing house in a mid-western city had long been known as a fine catalog house. It had been in business since the time of the proprietor's grandfather. The business had been profitable. The present proprietor's father, son of the founder, had put in a poster printing plant, run separately. The business was handled through one bookkeeping department. Catalog plant and poster plant were running night and day. One night the proprietor found the poster plant folders working overtime on a catalog order.

“Do we charge the catalog department with that work Profits
and does the poster department get credit?” he asked of Made by
the superintendent Savings

“Oh yes, they turn in tickets for it.”

The young proprietor thought it over that night while going home.

He spent the next day going over the tickets for last month's business. He thought he saw some queer things. He called in a cost expert. That expert finally got down to the detail where he could tell what it cost to have the “devil” pull a galley proof. He also found, among other things, that the catalog plant had been paying poster department losses for three years. Then the proprietor who had been working along with the expert, commenced to hire, fire and transfer. The old foreman and henchmen of the house made some gloomy prophecies of the awful things that were going to happen as a result of the change.

But the change worked, and anything is good when it works.

Cost finding is not a series of formulas like that which we get in chemistry. It is simply systematized processes of finding out where every item of material and time and expense go in the making of a product, or in the process of buying and selling goods. When two chemists are asked to give a formula of water, each will write H_2O —ask two hundred, the answer would be the same. Chemistry is a fixed science.

Ask two cost accountants what goes into costs and A Cost
you will get practically the same formula Formula

Cost of Material+Direct Labor=Prime Cost.

Prime Cost+Direct Factory Expense=Factory Cost.

Factory Cost+General Expense=Cost to Make.

Cost to Make+Selling Expense=Cost to Make and Sell.

Cost to Make and Sell+Profit=Price.

Profits
Made by
Savings

That is the formula and it will remain the same, no matter how many cost accountants you ask. They may phrase it differently, but the essentials will remain the same.

Suppose, however, you were to ask a hundred chemists to produce water according to the chemical formula. A careful checking of the expenses incident to the manufacture of a gallon by each of the hundred, would probably give you a hundred different costs. If you should compare the costs you would get at the man who made the cheapest gallon of water.

Take your cost formula and apply it to your product. Keep a careful record by departments and men.

You will get a line on departmental and man efficiency that will open your eyes.

Comparisons are necessary if you would get a just estimate of the relative activity and efficiency of your employes.

After all, the success or failure of any business is a matter of the quality of the man-stuff of which the business is made.

You can figure to the last decimal on the cost of your materials, your overhead, your rent and heat and light, know exactly what it is going to cost you to carry \$1,000 in loans at the bank; but (and this is just as important) what does it cost you to let John Jones handle your green groceries; or, what does it cost you to let Bill Smith do half as much work as Sam Perkins, who works next to him in your machine shop?

Why does it cost you \$200 a week for your accounting department when your competitors, Fitzgerald & Company, handle twenty-five per cent more business on \$150?

Why?

Why? When you come to that point you are getting in the frame of mind where you will use a cost system as it should be used—i. e., as a means to make profits.

Referees in bankruptcy will tell you that half the failures that occur in periods of good business occur because the bankrupts didn't know what their outputs cost them; they hadn't preserved the proper distance between cost and price.

Too many prices are made on the basis: "Well, if he can sell it for that, we can." Of course, that doesn't follow at all.

One western mill recently found that the old day-wage system was losing money for the firm, because the price of the goods was fixed by the consumer and the workman fixed the cost.

A piece-work wage system was introduced. A limit was fixed on the cost of the goods with an eye to meet the price fixed by the consumer. The system created a comfortable margin between cost and price, and by the system the tendency was for the margin to gradually grow bigger as the management found places where to economize in materials and time.

It is such simple things as these that work the revolutions in profits. The American business man has long neglected his office, his internal organization, in favor of his selling organization. Times are forcing a change.

We have, in the world's greatest and wealthiest nation, more failures than in any other nation. The vast percentage fail for "lack of capital," "for want of knowledge of the business"—so Dun and Bradstreet tell us. The commercial lawyers tell us that the principal "lack" is a practical knowledge of what it costs to do business.

If there is any place where the old adage—"Be sure you are right, then go ahead," means something, it is in the matter of fixing prices.

Without accurate costs you cannot intelligently and accurately fix price, is as plain as a pike-staff.

The principal difficulty, however, has lain in the handling of the time and materials. The records required

Profits
Made by
Savings

Profits so many hands and heads that the manufacturer preferred
Made by Savings to chance it, and dismissed the whole idea with the futile
pun: "It costs too much to know what it costs."

Like most generalities, however, this is dangerous. Again, it is no longer true. Since the introduction of the time clock for recording the gross hours of labor; the elapsed time recorders by which each workman records in plain figures on each card the time he has actually been at work; and finally, the Burroughs Cost Machines by which the time, the value of materials, and the costs may be added and listed on wide sheets from the individual records, and all other handling of figures done at a speed of three to five times as fast as formerly done by the most expert clerks, the expense of maintaining a cost system has lost most of its terrors.

Business men are now turning to the subject with a renewed interest further energized by the thought that it is better to be safe than sorry.

CHAPTER II

Putting in a Cost System

NEVER FORGET THE MAN," ought to be written in large letters over the desk of the man who is responsible for the systems used in any kind of business.

Too many systems are made on the assumption that the men working them are reasoning, thoughtful and analytical.

Most men are none of these things. In fact, even most of those men who are paid to think are not analytical; their thinking is mainly remembering how a thing was done before, and then doing it again.

Begin a system with yourself.

Decide that you are going to be honest with yourself.

The proper cost system registers the will of the proprietor. It goes as far as he will go. Some managers don't want to know too much about their business. It is surprising how much more common than may be supposed, this failing is. The average man approaches a cost system from the wrong angle. He doesn't want to find that he has not been making as much money as he should, because that reflects on his ability as a manager. He should, on the other hand, try to find out where he is not making as much as he should in order that he may remedy the oversight. In the first place, then, determine to find out what it has cost you to produce and sell your product for one given period. That will open your eyes to losses and perhaps unnamed profits. In the second place, decide that you will put in a system to find out what your future product will cost you.

Get at the costs; don't flinch or fumble, but go after and get the whole truth about yourself and your business.

Putting in a Cost System You may have some pet method of handling tools in the factory, charging the salesmen's expense, dividing territories, handling the accounting detail in the office.

You think it is efficient and profitable. It may not be. Be prepared to see it thrown on the rubbish heap.

Make your superintendent and your men see the new ideas in the same way. Employes are never glad to see changes. They don't know what they mean, and being ignorant of the purpose they generally imagine it means the worst results to themselves. Superintendents, managers who have been responsible for the systems you have in use, would be more than human if they did not resent the "new fangled ideas" that seem to be revolutionary and mean an indictment of their own ability.

Consider the man.

A Story A man told a story which shows the value of this man-knowledge so essential to the success of a cost keeping system:

"The management of a large machine works came down with the high-speed steel fever, a malady that needs a little description.

"High-speed steels, made for cutting tools in metal works, are so superior to ordinary carbon steels for certain work that from forty to one hundred per cent increase in production often follows immediately upon their introduction in a machine shop. They make it possible to run machines faster, cut more deeply and speed the work all around.

"This particular management tried high-speed steel and found that its costs could be reduced at least seventy per cent. That meant almost a revolution in prices and competitive conditions. An elaborate cost system was worked out, the new steels applied everywhere, and several contracts taken on terms that would have meant bankruptcy under the old scheme of things.

"And before those contracts were completed the works did face bankruptcy." Putting in a Cost

"For the new cost system wouldn't operate itself. System Workmen had not been taught to temper the new steels, a delicate process. No provision had been made for grinding tools to exact angles in a special department. There was an insufficient supply of tools for the new conditions, leading to losses of time. Worst of all, employes were suspicious of the whole innovation because it had not been clearly explained to them and they feared it was meant to put them at some disadvantage. The cost system was only a theory at that point. It had never been adjusted to the human equation, and it took more than a year of patient work among the men in different departments before such adjustment was brought about, making the theory fact."

The man power, without which a system is simply a theory on paper, had not been considered.

Managers frequently go at this phase of the question in a way that leads to needless loss. At the bottom every American workman is of the right stuff. That is not sentiment or patriotism; it is a plain statement of experiences.

When you throw aside your general managership, and get down on the floor and talk to these men as man to man, you can generally get them into line with almost any plan of betterment. It is the formal order like this that makes it easy to form unions and call strikes: Breeds Trouble

"On and after this date every workman in this factory will be put on a piece-work basis, as per schedule in the hands of each foreman.

By order of the Company,
JOHN JAMES SMITH,
General Manager,"

Go back over the labor troubles in your district and you will find a number dating from just such if-you-don't-like-it-get-out orders.

Putting Such orders come from a man who fails to realize that
in a every machine he has in his factory, every part of his
Cost System product, every sale he makes, every dollar of his investment depends for its efficiency on a man.

Contented men give a better result than mere men.

Enthusiastic men give a better result than mere contented men.

Men with pride in their work, with enthusiasm in their blood, and loyalty in their hearts can whip the world.

That sounds like sentiment. So it is—but the stuff that rules the world, certainly has a place in ruling a business.

When you get down to the men, show them that you trust them, tell them what you expect them to do, and that the system of costs is simply to protect them and you and your stockholders. You wish to place responsibility where it belongs, and will pay for it in proportion to its worth. Most of them will try to deserve responsibility, and you'll find it pays to get rid of the others.

Manstuff Don't forget the manstuff on which your system depends. This task is yours. Fix in your own mind clearly what you want a system for, what you want it to do, and why you want it.

The general advantages of any cost system are:

First—To reduce the costs.

Second—To increase production.

Third—To introduce machines to do work hitherto done by hand.

Fourth—To equalize the output in each department.

Fifth—To serve as a guide to selling.

Sixth—To serve as a guide to pricing.

Seventh—To serve as a basis to judge the product and efficiency and diligence of the workmen.

Eighth—To place the employer in a position to get a safe basis, independent of the judgment of the foremen of the different departments, on which to reward the diligent and to get rid of the lazy.

Ninth—To act as a moral stimulus to every workman and to insure fair distribution of reward to all.

Not one of these things can be handled with accuracy and safety unless you have a cost system.

Starting a system is important, where to start, how and when, for these take the time of men from a business that must be kept going while it is being doctored.

The expert has found his opening here.

The expert always pays his way. The doctor, the lawyer, the dentist are all unnecessary, but they are economizers of life, liberty and happiness. They get more for us than we could get for ourselves.

It is the same way with cost keeping. There are men who have made a special study of cost keeping. The cost keeper is generally an outsider who has made a study of costs as applied to manufacturing, wholesaling or retailing. There are experts who specialize on certain kinds of costs, such as foundry costs, costs in specialty manufacturing and costs in department stores, and so on through a score of lines.

The cost keeper should be more than a bookkeeper, while some bookkeepers have made excellent cost keepers. He must have an ability for analyzing processes, a grasp of manufacturing detail, and a knowledge of accounting, and then the final test of his ability as a systematizer comes in an ability to mould these things into a simple, workable system.

In its workability will be shown the value of knowing human nature. Each record required of a workman must appear to lead somewhere, say something, be complete. To ask a man to set down some apparently needless figures for an unknown purpose, is to make him

The
Cost
Keeper

Putting in a Cost indifferent and inaccurate, and that is to fail to get the facts in so many cases as to seriously interfere with the System accuracy of the final results.

Business is enough of a gamble even after a cost system has been installed without encouraging any one to guess at any part of the data it obtains.

There are two ways to find costs: First, estimated costs; second, absolute costs.

The process of estimating costs leads at best to self-deception. It argues a decision to install a cost system that shall give you a knowledge of what the items of your product actually cost you to produce, and then side stepping to introduce guesswork into the result.

It is a compromise that inevitably hurts more than it helps. It is not a system in any of its crude and imperfect parts. It is just a process of recording human guesswork, and has no more right to be called a system than a process of keeping books by which you guess at the amount of the items you enter to your debit, and speculate as to how much your customers should pay you.

Absolute Facts

The system by which absolute costs are obtained is an honest attempt to get at the real amount of labor, the real amount of material put into any piece of work. The ideal set before any costkeeper—dealing with absolute costs—is: "Get the absolute facts and figures about the various activities of the business." Approximations, guesswork, estimates and speculations of any kind are barred, and in their place is an ever present single minded desire to be absolutely accurate.

It must be realized that the value of the right system lies in the difference between average and maximum efficiency, between what is done by men who are left largely to their own devices, or the uncertain moods and ebbing and flowing energies of foremen, and men who feel the constant spur of working up to a standard.

The business man who thinks up to such a standard realizes that nothing happens in this world; that success or failure does not come as a result of good or evil fortune. Back of them is a cause. Back of all success there is a good and sufficient reason. The executive with a vision realizes that he must get at these causes and understand them. As he hunts for them amid the activities of his business, he is hospitable to the claims of all theories, of new machines, of time saving devices in office or factory. Nothing is poor in his eyes until it has been found wanting after a trial. No theory is bad just because it is a theory. He knows that theory is the egg, practice is the chicken. But in this hunt for details that shall show him where and whence to find the things that make or mar profits, the manager finds that these very details are the things that palsy the hand and the mind. He must deputize—hence the costkeeper.

Details will not come of themselves to the executive: the executive must go after the details, and he does this by means of a system through which are recorded all the time and materials used, and then a systematic distribution of these figures to certain divisions of processes or expenses, which he knows to be the source of the greatest possible loss to him.

He knows that profits will take care of themselves Profits when he has taken care of the losses. That is the executive's part.

Many cost experts have found that a graphic charting of the business helps to a proper analysis and aids in placing the matter in a proper light before those who will operate the system.

First, chart all the various departments of the business; under each department write exactly what the department does. Arrange each of these departments in the sequence of the work as it is done, or as the product comes through.

Putting
in a
Cost
System

Putting Arrange your system so the records will follow the
in a sequence of operations.
Cost

System Any factory or store not properly departmentized may
have a working chart arranged without in any way
interfering with the actual conduct of the work until the
system has been fixed. The simple principle of depart-
mentizing is, a department should handle the same class
of operations in a factory, or the same general lines of
goods in a store. Machine work should not be mixed up
with wood work in a factory, nor shoes with white goods
in a store. In the administration department the sales
making and the accounting branches should be divided,
the general executive departments should be individual-
ized.

For instance, take a machine shop:

This is divided into foundry, tool, paint, lathe, pattern,
polishing, planer work and assembling departments.
Each of these departments has its own expense covering
direct labor, direct material, general indirect expense.
The last is divided into departmental general indirect
expense and then into an account which carries a per-
centage of the entire indirect expense.

What a Any factory cost system should do several things;
Cost some of course, under certain circumstances, being much
System more important than others. Among the important
should things it should do are:
do

First—Ascertain the cost per unit on each line of
the factory product.

Second—Record the amount of time spent on each
operation, or each order.

Third—Show location in plant and the condition of
work on each unfinished unit.

Fourth—Show the amount of productive and non-
productive labor, and for what the non-productive labor
is used.

Fifth—Show the amount of productive and non-productive labor and materials, and give stage of development by departments.

Putting
in a
Cost
System

Sixth—Show total output, average monthly output, busy time and idle time on each unit of output, for day, week or month.

Seventh—Show cost per hour of operating each class of machines and by departments.

Eighth—Show relative overhead and direct labor cost per hour, or per unit, in each department.

Ninth—Show whether each operation is increasing or decreasing in cost, and, in its final analysis, whether you are making goods at a profit or a loss.

Finally, it should be understood from the start that cost keeping is not a fad. Be convinced that it is a prime necessity to financial success. Business—almost any kind of a business—is but a guess without it. It requires study and judgment and steady application of correct principles. From the time material is bought until it is fashioned by the workingman into the finished product, the manufacturer is at an expense that never ceases. To ascertain accurately the proportion of cost a job unit of production should be charged with, is the function of cost accounting. The actual work done—the visible work—the grinding, cutting, punching, shaping, heating, polishing, etc., are too commonly figured as the only cost chargeable against the job. In fact, these items comprehend about fifty per cent only of the true cost. Why this is so, and wherefrom these additional costs accumulate against each particular unit of the production, cost accounting makes plain.

CHAPTER III

Some Systems of Paying Wages

LABOR is time and time is money in factory economy. Time is one of the most expensive things the average manufacturer pays for, because it involves a cost that, in most cases, is about equal to cost of material and overhead expenses combined.

The proper cost system gives an absolute check on the time reports of workman and foreman and shows just how each man's time has been expended.

To know where and how we may most efficiently apply the time of our employes for getting the best results is the great question of the day.

No adequate answer to this question can be found elsewhere than in a complete and thorough cost system.

A man is paid wages in order to produce certain results. These results are more or less well defined just in proportion as each man's work in a factory is defined. It is not likely that any wage system, or any factory is so well organized that there is an absolutely fixed arbitrary standard for a man's activities, either in the quality of his work or the quantity he produces, yet wages are the standard by which men are judged in the world of labor, so that where high wages abound, good work is expected, and where low wages abound, a corresponding grade of work may be looked for.

On the other hand, the cost record of a factory is the standard by which men are judged of their importance, their ability and their productiveness in the economy of that factory. The amount of their wages is dependent upon that record.

It is therefore important that the man who works for wages produce all that the manufacturer can reasonably expect of him, or that the manufacturer has been

able to get from anybody else doing that same class of work. Hence the necessity for a manufacturer to know from actual records the worth of a man, not only for his own protection, but also that he may pay the man all that the work is worth.

Abstractly speaking, every conscientious man who thinks, should endeavor to produce the utmost for the money he receives, on the general principle that "He profits most who serves best," but unfortunately too few people regard the matter in this light. Therefore, we must take men as we find them, and in order to get the greatest efficiency, we have adopted various systems that place a premium on a man doing what he should do, and when we devise a wage system that will make a man *want* to produce the utmost for his pay, we will have the wage system that will immediately supplant all others.

There are numerous plans by which the wages paid to a workman can be determined. They are:

1—Day Rate Plan.	5—Bonus Plan.
2—Piece Work Plan.	6—Profit Sharing Plan.
3—Differential Plan.	7—Stock Distribution Plan.
4—Premium Plan.	

The value of any wage system over another necessarily depends upon the conditions of the plant in question, and the plan must be adopted after a careful study of these conditions and the nature of the product.

The different systems will be briefly explained in the following chapters.

CHAPTER IV

Day Rate Wage Plan

THE "day rate" or the "day's work" plan is one of the most generally used—first, because it is the simplest, and second, because it makes a less complicated payroll.

It applies both to high class labor and to men engaged in more or less routine work and those employed in non-productive labor.

It consists in paying a workman a certain rate per day or per hour; the amount of pay being determined by the market rate for the class of work and afterwards by the special skill of the workman.

There are objections to this plan, especially where no adequate cost system is used, because there is no incentive to make a workman do his best or to produce to his full capacity. He gets so much a day whether he makes 100 parts or whether he makes 75. If he happens to be faster than his fellow workmen and discovers that he is doing more work than they he asks for a raise, and if he doesn't get it, slows down to the same pace.

In other words, the day rate gives the men an opportunity to take it easy, their only incentive being a prod from the foreman when he sees that they are "soldiering." It is all in favor of the workman.

The only way in which a day rate plan can be equalized between employer and employe is by a cost system. Of course the total labor cost can be predetermined on account of the fixed rate paid to the men, but the relation between the rate and the amount of work each man is turning out cannot be exactly known unless some kind of record is kept.

There are some classes of labor where the amount of work is not measurable by quantities, such as engineers,

firemen, inspectors, truckmen, watchmen, clerks, etc. Day
These necessarily must be paid so much per day, but the Rate
men who turn out the goods can be measured by the Plan
amount of work they do.

Suppose that each man turns in a labor distribution ticket every night, showing how much work he has done during the day, or turns in a separate ticket when he has finished a job. . The information thus gathered, if properly used, will show the relative value of workmen.

This is especially true where a certain rate per hour is paid and there is prospect for an increase of pay with an increased amount of work. Under these conditions the labor distribution tickets which are turned into the cost department, and which show the time consumed on certain jobs by different workmen, contain data that indicates those who deserve a "raise." Without an increase of pay in view, the tickets would, in all probability, show a dead level of production on the part of all the workmen and be of no utility except to indicate that some man is wasting an unusual amount of time.

The necessity for a well-ordered system whereby a factory management can know the relative value of workmen arises from the fact that factory employes, as a general rule, are given to frittering away as much time as possible.

Time is money to the manufacturer always; to the Time is
employe only when it is made to appear so. Mone

The men are paid, say, for ten hours a day. If they waste half an hour or an hour of it the employer pays just the same amount as if the full ten hours had been productive. This increases the cost of his goods.

The table on the following page shows how much money a daily waste of five minutes amounts to in a year and should be studied carefully by every employer who is anxious to cut down the cost of production.

Day Rate	Rate per Day	Loss by 1 Man	By 10 Men	By 20 Men	By 25 Men	By 35 Men	By 40 Men	By 50 Men	By 100 Men
Plan	\$1.00	\$2.90	\$29.00	\$ 58.00	\$ 72.50	\$101.50	\$116.00	\$145.00	\$290.00
	1.25	3.62	36.20	72.40	90.50	126.70	144.80	181.00	362.00
	1.50	4.35	43.50	87.00	108.75	152.25	174.00	217.50	435.00
	2.00	5.80	58.00	116.00	145.00	203.00	232.00	290.00	580.00
	2.50	7.25	72.50	145.00	181.25	253.75	290.00	362.50	725.00
	3.00	8.69	86.90	173.80	217.25	304.15	347.60	434.50	869.00

Labor distribution tickets are made out by the foreman or his clerk, and on them are recorded the time of beginning and finishing a job.

They provide a means of keeping "tab" on the men and finding the exact labor cost.

This is especially true of a factory that is turning out a uniform commodity.

The very fact that each workman has a ticket and knows that the work he is doing will be timed by it in the cost department, makes him put forth more effort.

If he wastes time and escapes the surveillance of his foreman to-day, his ticket will indicate the extra time to complete a job and show the discrepancy between to-day's work and the work on the same job to-morrow or next day. Besides, there are other workmen engaged in the same work with whose expertness he can be compared.

The Adding Machine The adding machine plays a most important part in the addition of time and amounts on the labor distribution tickets, not only for getting labor cost of jobs and checking the payroll, which will vary with absentees, lates, new men, etc., but for compiling data from which information can be obtained regarding any man's record.

A daily or weekly charge to accounts or to departments, and the earnings of workmen, cost of jobs, etc., can be quickly determined with an adding machine.

In fact the machine makes possible the compilation of valuable statistics, within a reasonable length of time, such as would be practically impossible without it.

And a still greater advantage of exact statistical information is that it makes the day rate wage plan more equitable to the employer. It shows him whether or not his men are doing their work faithfully.

CHAPTER V

Piece Work Wage Plan

THE piece work wage plan is based on the principle of paying the employe for the exact amount of work he is capable of doing. He gets so much per piece or so much per hundred pieces, and therefore has a chance theoretically, and to a considerable extent in practice, to earn according to his efforts and abilities.

The tendency of workmen to lag when paid by the day or hour is so universally manifest in all kinds of business that the manufacturer must realize that he is paying too much for his labor when he uses this plan.

In order to remedy this defect in the day rate plan, the piece rate was instituted. No sooner did it go into effect, however, than the rate of production in some factories jumped by leaps and bounds and men who were formerly employed at \$2.50 and \$3.00 per day began to earn wages of \$4.00 and \$5.00.

This fact immediately showed the manufacturer that he had been imposed upon by his workmen while operating under the day rate plan. In order to adjust properly the wages to the class of work being done he made a cut in the rate per piece.

The inevitable cut shows the workmen that if they produce too much they will only set for themselves a high speed standard and still be unable to earn more than a certain maximum amount. So human nature again creeps in and the men begin to work just fast enough to get the highest wage without going beyond the limit that will mean a cut.

In this way the full advantage of a piece work rate is considerably modified.

This system also makes it necessary to inspect carefully all parts because of the increased rapidity with which

Piece Work Plan they are made and the corresponding liability to faulty workmanship. Each workman is held responsible for the parts rejected and in this way compelled to exercise care in their manufacture.

It requires tact and expert judgment to change from a day rate to a piece rate plan, and care must be taken that no intimation of the new plan gets abroad. For days, the rate of production of the men engaged in the different classes of work must be quietly observed in order to arrive at a fair price per piece.

It has been the experience of many manufacturers that when a price was thus arrived at, it was found to be far too high, as proven by the enormous increase of production following immediately after the piece rate went into effect. Because of this, considerable friction arises between the men and the manager before the piece rate is finally adjusted to the point where equity is guaranteed to both.

Another failing of the piece rate plan is this: If each man is allowed to earn according to his utmost power of production, there will always be found some, who by virtue of unusual skill, will earn a very large amount. This makes the manufacturer feel that he is paying too much for his labor and at the same time arouses the antagonism of other workmen who can't earn an equally large amount.

System Necessary An adequate cost system is necessary to the most effective handling of piece rate workers' time and earnings. Labor distribution tickets are used the same as with the day rate plan, the time required for making a certain number of parts being recorded. This information gives the cost keeper an opportunity to find out whether every workman is doing his best. Some men, who could earn \$3.00 per day by applying themselves, are content to earn \$1.75 or \$2.00 and ease down on their work accordingly. This is a detriment to the general efficiency of the factory and must be discouraged.

The cost keeper finds that the adding machine is indispensable for getting the total time and earnings of piece workers on different jobs without an undue expenditure of clerical time and labor.

After getting the total labor cost of a job or operation, the machine is used for making extensions to determine the burden or indirect expense on that job or operation and in this respect saves time and money. In addition to the time saved there is an assurance of accuracy in the listed proof of the work.

Many other additions and multiplications are necessary to get the total department cost, the total cost by accounts and to extend the price of certain parts requisitioned from the finished stock room.

And the Burroughs has the capacity both to add and list and to multiply, printing every item so that proof can be easily obtained. Then the totals can be recapitulated by accounts and the bookkeeper furnished with neatly and accurately tabulated sheets from which to make his postings to the Cost Ledgers.

CHAPTER VI

Differential Rate Wage Plan

THE third plan is known as the differential rate plan and has met with the approval of a great many manufacturers because of the equitable adjustment of wages to production.

This plan consists of paying the workman an increased rate per piece according to the increased number of pieces that he produces above a certain standard, and likewise of decreasing the rate per piece in case the number he produces falls below the standard, which has previously been fixed by ascertaining the average earning capacity of all the workmen.

The easiest way to explain this plan is by an illustration.

Suppose the manufacturer has found out by experience that eight of a certain kind of parts can be made by the average workman in a day of ten hours and that for each part 27 cents can be paid.

The manufacturer tells the workmen who are engaged on this class of work that if they will make ten parts a day and do the work perfectly, they will receive 29 cents a piece for them, and if, by their industry and ability they can make eleven parts a day, they will receive 30 cents a piece for the work. Likewise he tells them that in case they fail to make as many as eight parts, the price per part will be lowered so that if only seven parts are turned out, they will get 25 cents a piece for them. It will be seen from this that each workman is given an opportunity to earn extra money.

Looking at it from the manufacturer's standpoint the man who can turn out the most work even at the increased rate per part is more economical to him and reduces the final cost of each part more than the man who turns out

only a few pieces and gets the smaller rate per part. This is true because the burden or overhead cost for manufacturing a few more parts a day is not as great in proportion to the number of parts manufactured as when fewer parts are made each day and the work is spread out over several days. Thus the amount of burden to be added to the eleven parts that a skilled workman turns out in one day is not as great as the amount to be added to the same number of parts when made by a less rapid workman who turns out only seven parts in one day and leaves four parts to be manufactured the second day. This reduction of burden per piece very materially reduces the final cost.

The following table shows how the man who makes the fewest parts per day actually costs the company more money than does the man who make more parts and gets more for each part:

No. of Articles	Price per Article	Labor Cost	Cost of Material	Overhead Cost	Total Cost	Cost per Article
7	\$0.25	\$1.75	\$0.70	\$1.50	\$3.95	$56\frac{3}{7}$
8	.27	2.16	.80	1.50	4.46	$55\frac{3}{4}$
10	.29	2.90	1.00	1.60	5.50	55
11	.30	3.30	1.10	1.64	6.04	$54\frac{10}{11}$

One of the best features of this plan is that the poor workman gets poor pay and the good workman gets good pay, thus differentiating the grades of employes much more effectively than when the straight piece work plan is used. The poor workman cannot reasonably "kick" on his lower pay when he is shown that his inefficiency is actually making the manufactured article cost more per piece than in the case of the man who is getting higher pay and doing more work.

It is the opinion of cost experts that for a factory or plant where indirect expenses are very large in comparison to the cost of labor, the differential rate plan is almost sure to pay, but where this indirect cost is comparatively small, the advantage is more doubtful.

Differential Rate Plan

Poor Pay
for Poor
Men

Differential Rate Plan When the differential rate plan is in operation it is necessary to maintain a very rigid inspection department so that faulty workmanship due to the increased speed on the part of some workmen may not slip through.

A few advantages of the differential plan may be summed up as follows:

First—The wages are raised and the cost is lowered, thus bringing about a better feeling between employer and employe.

Second—The work is of a uniform quality, owing to the system of inspection.

Third—It obtains a maximum production per unit of time because of the fact that the workman is laboring for higher wages and at the same time is prevented from turning out inferior work by the inspection of the parts that he makes.

Fourth—It discourages and automatically relieves the factory of incompetent workmen since they can't blame anyone but themselves for their small wages.

Labor distribution tickets again enter into the proper recording of work done by this system. In order to have the required data at hand for figuring earnings, it is absolutely necessary to use tickets on which are given the time put on a job, the number of pieces made, etc. The strong point in favor of an adding machine to handle work of this kind is that it can be used for making the numerous extensions of rates per piece and the number of pieces turned out by each workman.

Multipli-
cation by
Machine Thus, in the example in Figure 1, there are three different extensions to make in order to arrive at the earnings of the men who turn out 132, 144 and 165 pieces respectively.

While these problems are simple, there are many where the number of pieces run into the thousands at a rate of so many cents or a rate of so many cents and mills per hundred.

This complicates the extensions and makes the adding machine especially useful.

Differential Rate Plan

To those who are unfamiliar with the Adding Machine it might seem like a contradiction to cite instances where it is used for multiplying, but as a matter of experience, it is capable of performing multiplication about three times as fast as it can be done mentally. It can be used with equal facility in handling either whole numbers or whole numbers combined with fractions.

The value of a listing machine in this case is obvious, since it records the operation and thus gives proof of the work.

NO PIECES	PRICE	NO PIECES	PRICE	NO PIECES	PRICE
1 3 2	\$.24	1 4 4	\$.26	1 6 5	\$.35
*		*		*	
1.3 2		1.4 4		1.6 5	
1.3 2		1.4 4		1.6 5	
1.3 2		1.4 4		1.6 5	
1.3 2		1.4 4		1.6 5	
1 3.2 0		1.4 4		1.6 5	
1 3.2 0		1.4 4		1 6.5 0	
		1 4.4 0		1 6.5 0	
\$ 3 1.6 8*		1 4.4 0		1 6.5 0	
		\$ 3 7.4 4*		\$ 5 7.7 5*	

Fig. 1

Facsimile reproduction of three multiplications made with a Burroughs Adding Machine.

CHAPTER VII

Premium Wage Plan

THE next wage plan, which is conceded to be one of the most successful in actual operation, is known as the Premium Plan.

This is somewhat similar to the differential plan, the difference being that instead of increasing the rate per piece, the increment of earning is based upon time saved. That is, a certain premium is given for the time saved in completing a job for which an average time has been pre-determined.

In addition, a minimum wage is incorporated in this plan, which assures the workman of a certain amount of pay in case he fails to save time on account of accidents, etc. This has placed the whole system in a more favorable light with the employes, thus reducing the general opposition to its installation.

It can best be illustrated by example: Suppose a man is working ten hours a day at the rate of 26 cents an hour. At this rate, he will earn \$2.60 a day.

The manufacturer tells him that if he will cut down the time on a job from ten hours to nine hours he will pay him 26 cents an hour for those nine hours, which is \$2.34, and will divide with him the wage that he would have been paid for work done in the remaining hour. If this division is on a half-and-half basis, the workman will get \$2.34, plus 13 cents, or \$2.47. Then he has another hour to work during which time he can earn more. If he saves two hours, he will receive 26 cents an hour for the eight hours, which will amount to \$2.08, and get one-half of the two remaining hours' wages, which, on the half-and-half basis, amounts to 26 cents. In this case he has two hours more during that day in which to earn an additional wage;

and even if he earns no additional premium during these two hours, he will at least get the regular rate of 26 cents per hour, or 52 cents in all. Premium Wage Plan

So for the day of 10 hours work under these conditions, he will earn \$2.08 pay for eight hours, plus 26 cents bonus for saving two hours, plus 52 cents additional wage earned in the two hours, or \$2.86 in all.

Thus the workman's superior skill and speed have earned him more money while the employer has obtained a greater number of parts at a lower final cost per part.

This plan has also the advantage of inspiring the men with an ambition to exert themselves to their full capacity and at the same time it automatically remunerates them according to their ability.

In the piece work plan the employe gets the benefit, the employer saving only in the burden or indirect expense. Under the Premium Plan, the profit is divided more evenly and both the employer and employe enjoy its benefits. The table, *Figure 2, gives an idea of the relative efficiency as to saving in labor cost between the different systems in vogue at the present day.

Systems	No. of Articles	Rate of Pay	Labor Cost	Gain per Hour	Material Cost	Overhead Cost	Total Cost	Cost per Article	Reduction in Cost per 100 Articles
Day Rate	8	.30 per hour	\$3.00	....	\$1.00	\$1.50	\$5.50	.6875	....
Piece Work	8	.32 per piece	2.56	....	1.00	1.50	5.06	.6325	....
Differential	10	.32 per piece	3.20	.64	1.25	1.60	6.05	.6050	\$2.75
	8	.32 per piece	2.56	....	1.00	1.50	5.06	.6325	....
	10	.34 per piece	3.40	.84	1.25	1.60	6.25	.6250	.75
Premium	8	.28 per hour	2.80	....	1.00	1.50	5.30	.6625	....
	10	.14 additional for each hour saved.	3.15	.35	1.25	1.60	6.00	.6000	6.25
Bonus	8	.28 per hour	2.80	....	1.00	1.50	5.30	.6625	....
	10	.32 per hour	3.20	.40	1.25	1.60	6.05	.6050	5.75

Fig. 2

Comparative Costs of Similar Articles as resulting from the different Wage Plans, showing effect upon Labor Cost, Material Cost, Overhead Cost and Total Cost.

* "Nicholson on Factory Organization and Costs."

Premium It will be seen that the premium plan has a great deal
Wage Plan in its favor as regards the reduction in the cost price per
article. This system also necessitates an exact set of
records in order that no workman will be deprived of his
just earnings and also that no "soldier" will share in the
premiums which he has not earned.

The labor distribution tickets necessary for this information can be handled with the greatest possible accuracy and speed on an adding machine. Likewise the many extensions that must be made where workmen are reducing the amount of time on a job and thereby earning wages based on this reduction, can be figured more quickly and accurately with an adding machine than by hand and mind.

CHAPTER VIII

Bonus Wage Plan

THE bonus plan is based on the principle of increasing the pay in a certain ratio as the time for completing a job is decreased, the rate depending on the per cent of time saved.

By referring to the table on page 45, it will be seen that where eight articles are made in ten hours, on the Bonus Plan, the rate per hour is 28 cents, and where ten articles are made the rate per hour is 32 cents.

This plan is practically the same as the Premium Plan and in fact some cost accountants make no distinction between them.

The same circumspection must be used in introducing this plan to the factory as with the Premium or Piece Work Plans, care being taken to fix as accurately as possible the rate of increase in wages resulting from time saved on a job.

One fact in connection with the installation of the Premium or Bonus Systems should be borne in mind. Where there is only a little machine work, the rate should be made fairly low, since the rate per cent of increase will be large. But if the work involves machine work it will require a greater application of skill and effort to effect a large increase, and therefore a Premium rate with a fairly high premium can be used.

In other words the increase where machine work is prevalent has been found to be comparatively small in contrast to manual work.

Other points of excellence in the Premium and Bonus Plans may be summed up thus: In using these plans the employe's reward is immediate as compared with the results of other plans, such as profit sharing. The fact

Bonus that quick rewards are obtained appeals to the average Plan workman.

The workman does not have to pay a penalty for not "speeding up," except the loss of his "bonus" or being discharged when he has proven unfit for the work. The minimum wage makes it easier to install the Premium and Bonus Systems because it does away with the intense antagonism that is generally shown when a new plan is proposed.

It is an excellent incentive for the men to exert themselves to their full capacity when they realize that they will be rewarded according to the amount of work they turn out.

The management does not suffer as much loss in case of an over-estimation in the rate of Premium or Bonus, and it provides a more equitable division of profits between employer and employe.

CHAPTER IX

Profit Sharing and Stock Distribution Plans

HERE are two other plans that are calculated to bring increased production and better relations between employer and employe. These are the profit sharing and stock distribution plans. There is not as much definite information about them as in the case of other plans because they have only been tested out in comparatively few cases. However, it will be well to understand the principles upon which they are based.

The Profit Sharing Plan embodies the feature of the workmen sharing in the profits of the factory but it has the defect of not discriminating between the good and poor workmen, both sharing the profits alike.

Then again, the increased profits of a plant may result from the selling force or from some source entirely outside the activities of the workmen, in which case they have no just claim to a share in the profits. And, if through some mismanagement, there are losses instead of profits, they object to standing their share of the losses.

Another disadvantage of the plan is that the rewards are too far in the future to be much of an incentive to the average man to put forth his best efforts. Ordinarily, the profits are figured but once a year and this means that each workman must wait a year before he can know how much his share amounts to.

A number of authorities hold that there is only one practical method of handling the profit sharing plan and that is to set a price on every article manufactured. The factory is charged only with such expenditures as relate to its production and a predetermined burden for supervision. The factory is then credited for all articles at this scheduled price whether they are sold or not.

Profit Sharing When the inventory is taken, the factory account in the ledger will show the factory profit and the difference between the actual cost and schedule price. Whatever saving there may be is distributed among the foremen of the different departments and in some instances among the employes, according to the rate of pay for each man.

Penalties are enforced for faulty workmanship, poor attendance, and so forth, according to existing conditions.

The stock distribution plan will probably be more successful in small shops where the proprietor and workmen are brought into closer touch with one another. The same defects exist in this plan when applied to the larger shops, as in the case of the profit sharing plan.

In reviewing the different wage systems, it must be borne in mind that the success of any one of them depends as much upon the manager's tact and sympathy and understanding of the workmen's attitude as upon the plan.

The System is Cold

Any plan in itself is a cold-blooded proposition, and in order to warm it up, it must be imbued with a good deal of human interest. In going about the installation of any wage system, the manager must study carefully the class of men whom he has employed and look at the whole situation as much as possible from their standpoint. By doing so he will provide himself with a guide that will lead to the plan best suited to his particular case and the one calculated to produce harmonious relations between himself and his employes.

The systems we have just outlined have been in actual operation. Some of them have proven more efficient than others but the object of all of them is to increase production and bring about an equitable adjustment between the amount of pay given out and the amount of labor received.

CHAPTER X

Judging the Costkeeping Requirements of a Factory

GREAT care should be taken in the introduction of a Cost System in a factory. In one case a firm manufacturing a specialty, and employing about 1200 men in the factory, introduced a system that ultimately required nearly 250 printed forms. When these were rearranged and a proper system was installed, all but 23 of the forms were discarded. The saving, of course, was tremendous.

This condition of over systematizing generally comes as a result of "letting the system work out itself," instead of having some specialist come in and work out a complete plan of costkeeping, coherent, logical, thorough, with definite objects in view.

Where a form is introduced to get a certain set of facts or figures—then another form to get something else—then another and so on, as is done in so many places, the cost system is a menace, breeding confusion and loss of time when it should nourish order and efficiency.

Remember, however, that mere forms do not make a system; nor do an adding machine, a typewriter, or a few clerks make a system. They are simply the physical expression of a system.

No form in this book should be put in operation by a manufacturer or business house, until it has been carefully considered, both in its relation to the specific thing that the form is to record, and in its relation to every other form in the system. It is well to keep in view one thing. Put on the form just as much data as you can. Don't, however, use any one form for entirely different classes of data.

Judging Requirements A cost system to be complete must embrace every item of expense connected with a commodity from the time the raw material is received in the factory, until the finished product is sent to the shipping room.

In order to provide a set of records that will give this information, cost has been divided into three parts:

1. Cost of Material.
2. Cost of Labor.
3. Indirect Expense or Burden.

Cost of material and cost of labor are very closely related, these two combined giving the prime cost or flat cost of any article.

The indirect expense, while a most vital factor, is in a way separate and distinct. However, it is necessary to know this indirect expense and to distribute it over all the manufactured articles in order that a selling price may be fixed that will insure a profit.

It is a well-known fact that all the raw material coming into the factory does not go into the manufacture of the goods: Some of it is used, for instance, to make tools with which the articles are made.

Division of Costs This leads up to the division of material cost into two classes:

First—Direct material cost.

Second—Indirect material cost.

The direct material cost is the cost of all material that goes into the product.

The indirect material cost is that which embraces the cost of factory supplies, tools and so forth, and cannot be charged as a component of the product. It is, however, included in the burden or an indirect expense.

Labor cost is also divided into two classes:

First—Direct Labor.

Second—Indirect labor.

The direct labor cost is that which constitutes the pay of the men who actually work on the product.

Indirect labor cost embraces all labor about the factory that does not actually produce goods. All foremen, repairmen, handlers of material, errand boys and the like, come under this classification, which is also included in burden.

Factory burden is composed of indirect cost of labor, indirect cost of material and indirect expense. Indirect expense includes such items as light, heat, power, maintenance, insurance, taxes, depreciation and similar expenses which are necessary to the manufacture of the goods.

Burden should be figured with the greatest possible accuracy and properly distributed over each of the articles manufactured, according to the amount of direct labor or of time and material expended in its production.

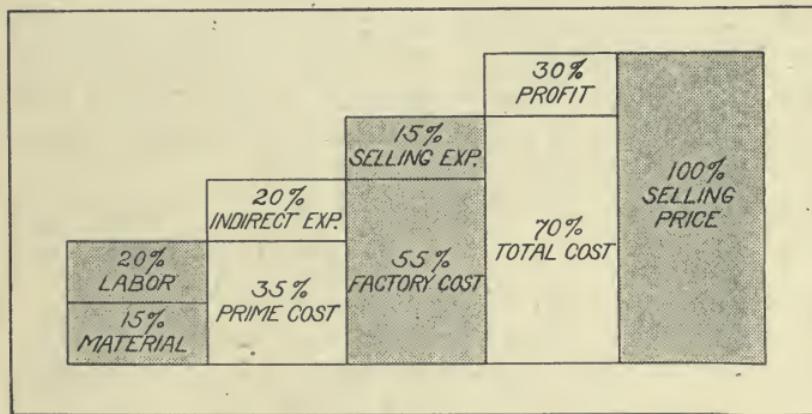


Fig. 3

Diagram Illustrating the Building of Costs.

The diagram in Figure 3, illustrates the building up of the cost of an article to the price at which it can be sold with a profit. It will be noted that material and labor, represented by 15 and 20 per cent of cost respectively, make up the prime or flat cost, which is 35 per cent. Then this prime or flat cost plus the indirect expense of 20 per

The Cost Diagram

Judging cent gives the final factory cost, which is 55 per cent. The Requirements final factory cost plus the selling and administrative expense of 15 per cent gives the total cost of 70 per cent, and the total cost of 70 per cent plus the profit of 30 per cent gives the selling price of 100 per cent. A careful study of this diagram will explain clearly the various elements that go to make up the selling price of a commodity.

Remember, that the cost of goods when placed in the shipping room, does not include the expense necessary to market the product. Manufacturing costs and selling costs are two separate and distinct propositions and must not be confused with one another. By fixing this fact firmly in mind at the outset much trouble will be avoided.

CHAPTER XI

Handling Material; Perpetual Inventory Suggestions

THE cost of material is comparatively easy to obtain. The price paid for it depends on the market. To this is added all charges in connection with handling it. Therefore when the amount required to make a certain number of articles is definitely known, it can be charged up at the same rate at which it was purchased.

We have already pointed out that raw material is divided into direct and indirect. The direct, in some cases, is divided into accessory material and finished material. Thus, a plant manufacturing a commodity made up of a large number of stamped parts would consider cold rolled steel or metal sheets as part of its raw material, while the plant that manufactures cold rolled steel would consider pig iron as raw material, and the furnace in turn that manufactures pig iron would consider iron ore as raw material. Therefore, the raw material in any plant is the material as it is received before any change has been made in it.

Even finished parts, if received, are classed with the raw material which goes into the make-up of a commodity. Thus a furniture manufacturer would class with his raw material such items as handles, knobs, casters, etc.

Accessory material is that which does not go into the product itself but is used in its manufacture. In this class fall such items as tool steel out of which certain tools are made, repair material, etc.

The market may fluctuate, it is true, but still the mean or average price of material is easy to determine.

Some factories contract for a year's supply of raw material at a fixed rate and in this way the market

Handling fluctuations have no effect upon the cost, except at Material long intervals.

The operations necessary in handling raw material are its purchase, storage and subsequent distribution through the factory.

The cost authorities seem united in favor of the perpetual inventory as a system for handling material. Some of the most successful say: Perpetual inventories are undoubtedly the best, because by them we are able to keep an exact record of stock on hand; we know the minute we arrive at a point where it is advisable to place orders for new stock so that no part of the supply may become exhausted before a new supply is in hand.

Perpetual inventories require perpetual attention. The difficulties in handling them have been largely due to lack of attention upon the part of employes. There are some very simple rules that should be noted.

Constant Attention *First*—No material should be permitted to leave the raw stock room without a requisition, signed on behalf of the department where it is to be used.

Second—All requisitions must be checked up each night before closing, and for that purpose an hour should be established in the afternoon, after which all requisitions of the day should be filled the first thing in the morning.

Third—Low water marks should be established by which the Supply Clerk can be protected, and the Purchasing Agent can be warned of the possible exhaustion of the supply.

Fourth—A large low water mark should be placed on each kind of raw material so that the Purchasing Agent may have sufficient time to get new estimates before ordering a new stock of material.

Fifth—Perpetual inventory records should be treated as cash is treated. Cash is verified often, or should be, so inventory should have regular periods for verification.

The perpetual inventory of raw stock or raw and semi-finished stock constitutes only a part of a complete factory stock inventory, because there is always a great deal of stock in process of construction. Handling Material

Since every hour of labor expended on raw or semi-finished stock enhances its value, it is obvious that all stock in process of manufacture will be worth considerably more than the raw or semi-finished stock. Furthermore, the stock in process will not be indicated on the perpetual inventory record since it is charged off the card when requisitioned by the factory foreman.

Therefore, it is necessary to rely on the cost records to get an accurate value of stock in process. This is easily accomplished by noting the various departments through which the stock or material has passed up to the time of the inventory and then figuring the labor cost and burden expended and adding to this the value of the material as indicated on the requisitions, carbon copies of which are always sent to the cost department.

Thus by co-ordinating the perpetual stock records with the cost department records the value of raw and semi-finished stock and of stock in process can be obtained with a great degree of accuracy. Raw and Finished Stock

The individual stock card for each class of material applies equally well to raw stock and semi-finished stock. Thus, in a factory that makes parts from raw material and then assembles machines from those parts into complete machines or other product, two sets of perpetual inventory cards are kept, one for raw material and one for the finished parts or semi-finished material. Both sets of records are kept in the way described above. See Figures 67 and 68 for Finished Stock Records.

In the proper recording of all material, one of the best forms of record is a perpetual stock card. This consists of a suitable card for each class of raw material and on it

Fig. 4
Perpetual Inventory of Raw Stock.

is recorded the amount of material and the date when it is received. The distribution of the material is made on receipt of requisition blanks, which give the amounts taken from the stock room and show the job to which

1 3 5 8 7 $\frac{1}{4}$	*
1 9 7 4	*
1 1 5 8 4	*
6 5 0 9	*
1 7 1 9	*
3 5 3 7 3 $\frac{1}{4}$	*
2 4 0 0	*
1 3 0	*
2 6 3	*
.2 0	*
1 3 4 0	*
1 3 0 1	*
.1 0	*
.3 0	*
1 0 2 5 $\frac{1}{2}$	*
1 8 5 0	*
1 4 6 7	*
1 2 2 3	*
.4 0	*
1 1 3 0	*
.1 0	*
4 2 6	*
2 8 0	*
2 7 7 4	*
.1 0	*
.1 0	*
1 5 7 3 9 $\frac{1}{2}$	*

the material is to be charged. These amounts are deducted from the balances on their respective stock record cards. This gives the factory a perpetual inventory of all the different kinds of raw material remaining in the stock room.

The use of an adding machine not only expedites the work, but assures its accuracy. In Figure 4 is shown the stock record card used in a factory for recording each kind of stock. It is checked up with the adding machine as follows:

When a sufficient number of requisitions have been given to fill the column of "amounts issued," the stock-keeper takes the adding machine and adds up the different amounts that have been received together with the original balance. In the illustration on this page the total of amounts received and the original balance as secured with the adding machine is 35,373 $\frac{1}{4}$ pounds, the whole numbers and fractions being added at the same time. Then he adds the amounts issued, securing a total of 15,739 $\frac{1}{2}$ pounds, and deducts this total from the total amounts received. If the remainder corresponds to his last balance (19,633 $\frac{3}{4}$), he knows that the

Handling column of balances has been properly extended and can, Material therefore, carry the last balance forward to the back of the card, knowing that his work is exactly right.

On each requisition is recorded the kind of stock used, the price, the date it was withdrawn, the part into which it was made and any other information necessary to show exactly where and for what the raw material was used. By indicating on each requisition the job number or symbol, it is an easy matter to find the material cost of a job by adding up the requisitions bearing any particular job number. This is done very quickly and accurately with an adding machine.

CHAPTER XII

Handling Labor Costs

THE cost of labor constitutes a large part of the total cost of any commodity. It also embraces the greatest amount of detail work because it is necessary, not only to ascertain the labor cost of every article, but to record various kinds of data relative to the efficiency of workmen, which is obtained from their labor distribution tickets.

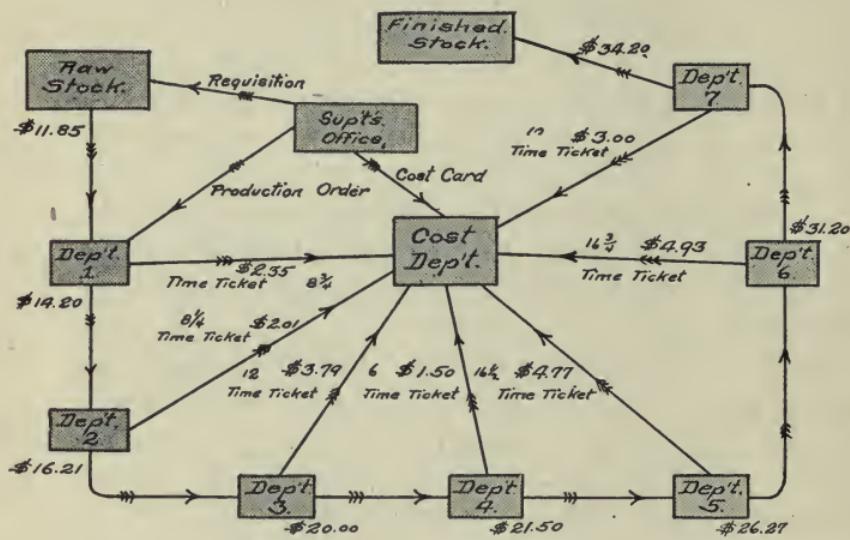
No matter how many different jobs or parts of jobs any one man may work on, he is paid for the work and his work contributes toward the building of a certain product. For this reason, it is necessary to keep an accurate record of all the time he devotes to the job and the amount he earns, the nature of this record of course depending upon the wage plan used at the factory.

One of the greatest leaks in connection with labor cost is due to the workman's loss of time, either on account of getting started on new jobs slowly or on account of "soldiering." Therefore, in finding the cost of labor with a view to cutting it down as much as possible it is essential that such loss of time should show up on the records.

All the necessary information for compiling this data is given on labor distribution tickets. On these are recorded the job number, the date, the workman's number, and the time required to complete a job together with the earnings.

In handling these an adding machine is almost indispensable.

Obtaining the total cost of each job is only one of the operations necessary in connection with labor tickets. They must be handled several times and a great deal of adding and listing is necessarily done. For instance, the total cost of a job must be obtained. Then the total cost of manufacturing by departments, the total amount to be



LABOR COST.	
Time	Amount.
8 $\frac{3}{4}$	2.35
8 $\frac{1}{4}$	2.01
1 2	3.79
6	1.50
1 6 $\frac{1}{2}$	4.77
1 6 $\frac{3}{4}$	4.93
1 0	3.00
7 8 $\frac{1}{4}$	22.35*

Fig. 5 .

Diagram showing the increase in value of raw material as it passes through different departments and an example of adding machine work, where time and amounts are listed and the two totals obtained at one operation.

charged to the numerous manufacturing accounts and ^{Handling} _{Labor Costs} checking up the pay roll, etc., and various other recapitulations are necessary.

It is in this connection that the adding machine comes in, not only as a time and labor saver but for proving the accuracy of the work. Items that are listed can easily be checked and verified.

The accompanying diagram, Figure 5, gives a general idea of the detail work necessary to figure the cost of labor.

The order for a job originates in the superintendent's office. One of his clerks makes out a requisition for the necessary material and sends it to the Raw Stock room. This notifies the Raw Stock keeper that a job has been started and that certain material will be used. It also gives him authority for honoring the foreman's requisition for the material.

A production order describing the job is sent to the ^{Starting} _{the Job} foreman of the department where the first operation is to be done. A cost card, also describing the job and showing the cost of the material, is sent to the Cost Department.

The foreman in Department 1 then draws all the material or part of it, as the case may be, and begins the job.

The material in this case is worth \$11.85. Department 1 does \$2.35 worth of work on it, thereby increasing its value to \$14.20 exclusive of Burden, which is ignored in this instance. The partly finished job is then sent to Department 2 and a time ticket for operation No. 1 showing \$2.35 is sent to the Cost Department.

Department 2 does \$2.01 worth of work on the job and thereby increases the value of the material to \$16.21. A time ticket showing the labor cost of \$2.01 is sent to the Cost Department.

The material passes on in this way to all the departments, which send their time tickets to the Cost Department. Department No. 7 finishes the job, which is now worth \$34.20, and turns it into the Finished Stock room.

Handling Labor Costs The Cost Department then sorts the tickets pertaining to the job from the many others that have been sent in and adds the hours and amounts on the Burroughs Cost Machine. This gives the labor cost for the job and the time required for its completion, the hours and amounts are added and listed at the same time with this machine. The two totals are printed by pressing the total button and pulling the handle.

The Burroughs It is obvious that the Cost Department will handle quite an accumulation of tickets in order to get the total labor cost of all jobs, and it is for this reason that the adding machine is so exceedingly useful.

The foregoing gives a general idea of what is necessary for figuring cost of labor. The other recapitulations of labor tickets by departments for figuring Burden by accounts, for figuring labor distribution and so forth necessitate an equally large amount of adding. A more complete outline of the work is given later in the description of the cost system used by the Burroughs Adding Machine Company.

CHAPTER XIII

Indirect Expense or Burden

THE question of computing and distributing the Indirect Cost or Burden, which constitutes from twenty-five to two hundred and fifty per cent of the total cost of a finished product, according to the nature of the product and the conditions under which it is manufactured, is one of the most puzzling questions involved in costs.

At the outset it must be distinctly understood that there is a difference between Factory Burden and Selling Expense. The former has to do with the productive cost of the goods, the latter is separate and apart and is confined to putting the goods on the market.

Factory cost, which includes Burden, is the value of the product when it is turned into the warehouse or shipping room. The selling expense cannot be included in this value because it would inflate it by just that much and give an erroneous asset on the balance sheet when inventory is taken.

If the general manager of a manufacturing concern looks after the selling and his assistant looks after the manufacturing, the salary of the former goes into selling expense and the salary of the latter goes into burden as part of the factory cost. While he does not handle the product personally, his expense to the factory is necessary in supervising its manufacture and must be included as part of the cost.

In short, the whole object of burden distribution is to allocate the charges which constitute it in such way that every department in the factory will bear its proportionate share. When this has been done, the cost keeper can tell to a very close figure the cost of every article, whether it has been handled by all departments or by only one or two of them.

Indirect Burden includes every expense necessary to the
Expense or manufacture of an article outside of the direct labor cost
Burden and cost of material. The numerous elements that make
up Burden are given in the following:

- 1—Indirect Labor.
- 2—Repairs and Maintenance.
- 3—Heating, Lighting, Rent, etc.
- 4—Taxes.
- 5—Insurance.
- 6—Depreciation.

Indirect Labor includes the labor of all the men and boys about the factory who do not work directly on the product. The superintendent's salary comes under this classification, likewise that of his assistants and foremen.

Since it is usually necessary to have a building in which to make goods, the cost of supplying it with heat, light, power, etc., must go into Burden. If the building is rented, the rent is included in Burden. In like manner taxes, insurance and maintenance are included in Burden.

Spreading the Burden In spreading Burden it is the best practice to divide each element on a monthly basis so that any changes in factory conditions tending to raise or lower it can be more quickly and easily adjusted.

For example, if the heating of a factory costs \$1200 a year, this element of Burden will be divided into twelve parts and spread over the factory departments on the basis of \$100 per month. In subdividing the \$100 for each department the total cubical contents of the factory is taken and each department receives a part of the Burden which is proportionate to its contents. Thus, if a factory has a total of 150,000 cubic feet and Department "A" has 30,000 cubic feet, this department will receive $30,000/150,000$ of the \$100, which is \$20.

Rent, taxes and insurance are distributed in the same general way.

Indirect labor, depreciation and repairs and maintenance, however, must be proportioned according to the

amount of each that is incurred by a department, because it is a rare exception when every department of a factory will require a part of Burden that is proportionate to its size.

After the Burden has been spread over the departments on the monthly basis it is distributed to the product according to one or more of the methods which are described on the following pages.

These elements of Burden are comparatively easy to ascertain and can be spread over the various manufacturing departments with sufficient accuracy for all practical purposes.

But depreciation, which is also an element of Burden, is different, and requires more study, care and experience in its calculation than all the other elements put together.

Depreciation
Depreciation applies both to buildings and equipment, the amount to be charged off depending on several conditions. For instance, a frame building is comparatively short lived, while a building made of concrete and steel endures for many years. Therefore, a higher rate of depreciation must be charged off for a frame building than for a concrete steel building. On the other hand, the difference in these rates will not be so great as the difference in the structure would indicate. The frame building may be made of good timber and contain light, smooth-running machinery, while the concrete-steel building may contain heavy, vibrating machinery.

From this it will be seen that the nature of the building itself is not all that must be considered in fixing a rate of depreciation. Ordinarily the rates for factory buildings are from 2 per cent to 6 per cent, depending upon local conditions, the kind of structure and the nature of the work going on within the walls.

In the case of machinery, the percentage covers a broader range running from $2\frac{1}{2}$ per cent to $12\frac{1}{2}$ per cent.

Indirect Expense or Burden This also depends upon the amount and kind of work the machine is called upon to do and requires close observation and experience to determine.

It has been observed that some machines depreciate rapidly the first year or two, and after that at a much slower rate, while others depreciate very slowly for the first few years and then seem to go to pieces at once.

Again, some machines can be operated in a more or less dilapidated condition while others must always be in the best running order.

There are other considerations in fixing depreciation aside from actual wear and tear. Maintenance or upkeep has a direct bearing upon depreciation in that an effectual maintenance from year to year, especially on certain kinds of machinery, affects in large measure the loss due to depreciation.

Reserve Account Thus, if a machine worth \$1,000 depreciates at the rate of 10 per cent per year it will be worth \$900 at the end of the first year, and \$100 will be set aside as a reserve to take care of the depreciation. If, however, \$50 is spent in repairs to the machine which restores it to a condition practically as good as new, it is the general practice, except in very conservative concerns, to take this \$50 from the \$100 depreciation reserve fund instead of charging this item of repairs to General Expense.

Then the stability of the machinery as regards up-to-dateness must be considered, because in some manufacturing businesses methods are improving so constantly and new style machinery is required so frequently that a much higher rate of depreciation must be used. There are cases where a machine, practically as good as new, must be scrapped on account of a more improved machine coming on the market. Obviously the rate of depreciation in such cases is exceptionally high.

The problem of depreciation is further complicated by the fact that a business itself may not be permanent, yet

it may require some highly specialized machinery, in which event a decreasing demand will mean a decreasing value of the plant.

Indirect
Expense
or
Burden

Summing up a few of the many points necessary to consider in fixing a rate of depreciation, we mention:

First—The nature of goods manufactured, whether staple, specialty or novelty.

Second—The kind of machinery used, heavy or light, fast or slow moving.

Third—The kind of buildings used and the nature of the work within them.

Fourth—The location of the plant regarding increase or decrease in value of property.

Fifth—The nature of maintenance or upkeep.

Sixth—The exposure of equipment to the elements.

Seventh—The permanence in style of machinery and equipment.

At first sight it would seem an almost hopeless undertaking to fix a rate of depreciation with anything like accuracy; but fortunately there are a great many concerns similar in the nature of their product, whose experience can be studied and compared. Then, the Fire Insurance Companies, who base their risks on depreciated values, have evolved from their large experience certain principles governing depreciation which can be relied on as giving very good results.

Available
Experi-
ence

In regard to the prorating of depreciation over the various manufacturing departments in a factory it may be well to mention that the best practice consists in dividing the annual depreciation into twelve parts, so that a certain amount can be included in the factory burden each month. Thus, if a \$60,000 plant has a depreciation of 10 per cent per year, instead of charging off \$6000 at the end of the year, divide this amount by

Indirect 12 and charge off \$500 monthly as part of Factory
Expense or Burden. By treating depreciation in this way the true
Burden production cost is secured every month.

So much, in a general way, for the different elements
that go to make up Burden. We will now briefly describe
the different methods of distributing it over the product.
These methods are very important in determining the
best way to get at the cost of a product.

CHAPTER XIV

Distribution of Burden

BURDEN may be distributed in many different ways and the right way can be decided upon only after a study has been made of the conditions in the factory where the cost system is to be installed.

The following methods of distributing burden are most commonly used:

- 1—Direct Labor Cost Method.
- 2—Direct Labor Hours Method.
- 3—Direct Labor and Material Method.
- 4—New Machine Rate Method.
- 5—Fixed Machine Rate Method.
- 6—New Pay Rate Method.

A knowledge of the general principles on which these methods are based will give a better insight to the method best adapted to your business.

It is important to use the most economical and effective system, but there are one or two easy methods that work out to fallacious results and are therefore bad.

Spreading a fixed blanket burden over all departments is essentially wrong in principle, because the article, for instance, going through two departments should not bear the same indirect expense as that which goes through six. It will generally be found that figuring an indirect expense on a percentage principle leads to false conclusions, and it is important not to have false conclusions in any system which attempts to be accurate.

For instance, it was found to be a poor system that distributed, as part of a blanket burden, the salary of a General Manager who devoted his time to the selling end of the business. The result was an inflation of the value of finished stock because the indirect labor, which was

Distribution of Burden part of selling expense, had been included in the Cost of Production, and distributed without reference to the department in which it was employed.

In figuring burden the growth and alteration in the factory or the changes of processes should always be taken into consideration. For this reason it is advisable to prorate overhead charges monthly, so that the burden rates can be checked monthly, or at least every three months. Under average running conditions the rate will undoubtedly fluctuate, but the fluctuation can usually be attributed to some specific cause. In cases of improved methods of manufacture, the monthly or quarterly burden test will show the rate so much altered that a change will be necessary in order to distribute the correct amount of burden.

Direct Labor Cost Method of figuring burden is one of the most generally used on account of its simplicity. It is based on the principle that the product increases in value as labor is added to it and consequently the greater the amount of labor applied to its manufacture, the greater will be the expense of supervision and management.

The method of obtaining the ratio of indirect expense to labor cost is very simple, the process involving the division of the total amount of indirect expense by the total amount paid for labor during the same period of time. In other words, if the total indirect expense for one month is, say \$7,000, and the total expense of labor for the same period is \$9,200, the per cent of burden to be distributed over the different articles will be $7,000 \div 9,200$ or 76 per cent.

This extra charge is added to the articles made during the same period. In this way each article is charged with a certain part of the indirect expense of the entire plant, the amount varying according to the cost of labor put upon it. Thus if an article has \$1.25 worth of labor put

into its manufacture and the material cost is 75 cents, according to the above ratio, 76 per cent of \$1.25, which is 95 cents, is added as burden, making the total cost \$1.25 (labor), plus 75 cents (material), plus 95 cents (burden). The same principle is used in distributing the total burden of \$7,000 over the various articles manufactured.

The different departments of a factory may vary considerably in their process and equipment and if the nature of the article is such that it passes through many different operations, it is almost certain that the indirect expense in some of the departments will be greater than in others. Again, certain articles may be completely finished in one department while others pass through several departments, and the indirect expense of the one department may be far greater than the average indirect expense of the other departments. In this case a general average of all the departments, including the one, will be lower than the expense of the one department and hence the true cost of the article manufactured in that department will not be obtained.

Where departmental conditions are different and an average rate is used, it is evident that the extra indirect cost of manufacture in certain departments will be loaded on other departments where the expenses are not so heavy. While an average rate will give the cost of all the articles combined, under these conditions it cannot give accurately the cost of each individual article. This information is necessary in fixing selling price.

Another phase in connection with this method is that the rate of paying all the workmen is not always proportional to the indirect expense, because a man working for \$1.75 a day will oftentimes incur more indirect expense than the man who earns from \$3.00 to \$3.50 a day. An example of where this may occur is found where a cheap workman is operating an expensive machine and an

Distribution of Burden

The Average Rate

Distribution of Burden expensive workman is operating a cheap machine. In the former case, the overhead charge will be too small and in the latter it will be too great.

Again, if a manufacturer is fighting competition with certain articles, such a method of adding burden will not give the exact cost of those articles and hence it will be impossible to fix accurately their selling price with a view to making sure profits on their actual cost.

Apparently such a method is erroneous, but the trouble lies in the fact that an average cannot be estimated on a number of different kinds of articles. If a system that is based on wages is to be operated successfully, the wages must represent the true conditions of production and must be in proportion to the actual cost. This condition is found only where labor is practically uniform as regards production, wages and amount of time consumed on each operation.

Applying the System To apply this system successfully, the percentage of burden must be calculated by departments. In this way a close approximation to the true cost of the article can be obtained. Under this method the total indirect cost of \$7,000 for the whole plant is divided up into smaller amounts chargeable to each department and prorated to articles manufactured according to the amount of burden the department incurs in performing its respective operations upon them.

The diagram, Figure 6 makes clear the principle of apportioning burden departmentally.

In this case it has been calculated that for each dollar's worth of productive labor in Departments 1, 2, 3, 4 and 5, a burden of 75 per cent, 67 per cent, 85 per cent, 91 per cent and 83 per cent, respectively, shall be added to the direct labor cost of the product in order to obtain the total factory cost.

Thus a batch of raw material comes to Department 1 and is valued at \$12.75. In Department 1, \$3.20 worth

of labor is done upon it. This increases the value to \$15.95. Then 75 per cent of the labor cost, \$3.20, which is \$2.40, is added to the \$15.95, giving a total cost of \$18.35.

Distribution of Burden

The partly finished material is passed on to Department 2 where \$2.10 worth of work is done on it. This amount together with 67 per cent of \$2.10, which is \$1.41, is added to the \$18.35, increasing the value of the partly finished product to \$21.86.

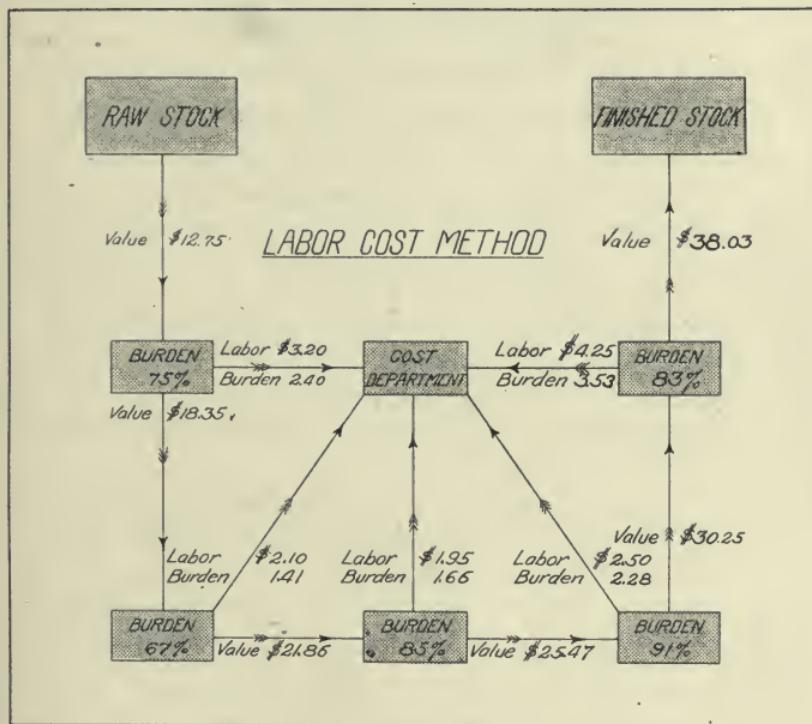


Fig. 6

Graphic Illustration of the Labor Cost Method of Figuring Burden.

In this way, the material passes on through Departments 3, 4 and 5 to completion and is turned into the Finished Stock Room, worth \$38.03.

The Labor Distribution Tickets made out by each department that performs an operation on this material, are sent to the Cost Department and give the labor cost for each of the operating departments.

Distribution of Burden When the job has been finished the amount of burden to be charged to the product is calculated from data on these tickets.

Then by adding to the amounts of labor and burden, the value of the material used, the total cost of the job is obtained.

Inventory of Work in Process There is another very important point in this connection which should not be overlooked. It pertains to the inventory of work in process.

Suppose, for example, a batch of partially finished goods has just come to Department 4 at the time the inventory is being taken, and it is desired to find its true value.

On the supposition that individual time tickets have been used, all such tickets relating to this particular batch of semi-finished stock, will have been sent to the Cost Department and filed behind the cost card for this job. When the inventory clerk finds this semi-finished stock in Department 4 he takes note of the job or order number and reports to the Cost Department that job so and so is in Department 4 ready to go through the operation performed by that department.

The cost clerk then turns to the cost card for that job, sorts the time tickets by departments, which in this case will be for Departments "1," "2" and "3," gets the total labor cost for each of these three departments, figures the burden for each and combining these two totals with the value of the material, obtains the true cost of the semi-finished stock as it lies in Department 4.

The same method is used for getting the value of all work in process and can be done quickly and accurately when the cost records are kept in proper shape. The usefulness of the adding machine for getting the labor totals is obvious.

Direct Labor Hours Method The **Direct Labor Hours Method** is similar to the direct labor cost method, both of them being methods by which the burden is distributed on the basis of a

general average rate. The difference between them is that different bases are used for determining the burden. This method is based on workmen's time instead of labor cost, the hour being taken as the unit of time. In other words, the indirect expenses of a plant are distributed according to the hours worked by the employes instead of the wages they receive. A rate per hour is obtained by dividing the total indirect expense for a certain period by the total number of hours for the same period and in this way determining the amount per hour to be added to the cost of production in order to get the total cost.

Thus, if the indirect expenses are \$7,000 and the total number of productive hours are 50,000, the amount of burden per hour would be $7,000 \div 50,000$ or 14 cents per hour.

Applying this method to the example given under the Labor Cost Method with the assumption that the labor cost of \$1.25 represents 5 hours work, the cost will be \$1.25 plus 75 cents for material, plus $5 \times 14 = 70$ cents burden or \$2.70, as against a total cost of \$2.95 in the case of the labor cost method.

The difference in the total cost of these two methods is very easily explained since by the first method the amount of burden varies according to the amount of money each man earns but by this method it is distributed equally among high priced and low priced men, the basis being the number of hours each man works.

In the former case the articles produced by a high priced employe are charged a greater amount of indirect expense than those produced by a low priced employe. Since, by the direct labor hour plan, the indirect expense is divided equally between high and low priced employes on the assumption that they work the same number of hours per day, the two sets of costs do not exactly agree.

Distribution of
Burden

Distribution of Burden This method of distributing burden also lends itself readily to accurate valuation of work in process at inventory time. It is very similar to the method just described under Labor Hours Method.

Inventory of Work in Process Under these conditions, however, it is necessary after distributing by departments the time tickets pertaining to a job, to get the total hours of work put in by each department. Then the rate per hour of burden for each department is multiplied by the total number of hours, thus securing the burden for each department. Then these items of burden are recapitulated and combined with the value of labor and material used on the job up to the stage where the inventory clerk finds it, and the inventory value is obtained.

The most effective application of the labor hours method is found by dividing the factory into departments determined by similarity of machinery or processes and calculating the hour rate according to the number of hours put in by the men in each department.

When the general average method is employed the apparent cost of the product may be so far wrong that the manufacturer may discourage sales of articles that are making money and encourage sales of others which are sold at an actual loss. These conditions are due, of course, to the fact that too much burden is charged to certain articles and too little to others. Taken altogether, the direct labor hours method is somewhat more accurate than the direct labor cost method if the work is departmentalized, unless the labor cost happens to be proportional to the true cost of production.

Both methods are more or less imperfect as regards accurate results, when applied to a factory as a whole, because they are not based on elements which represent actual conditions, except in the case where the product

and process are very simple and uniform. The departmental method of distributing burden on these plans is the only one where accurate results can be expected.

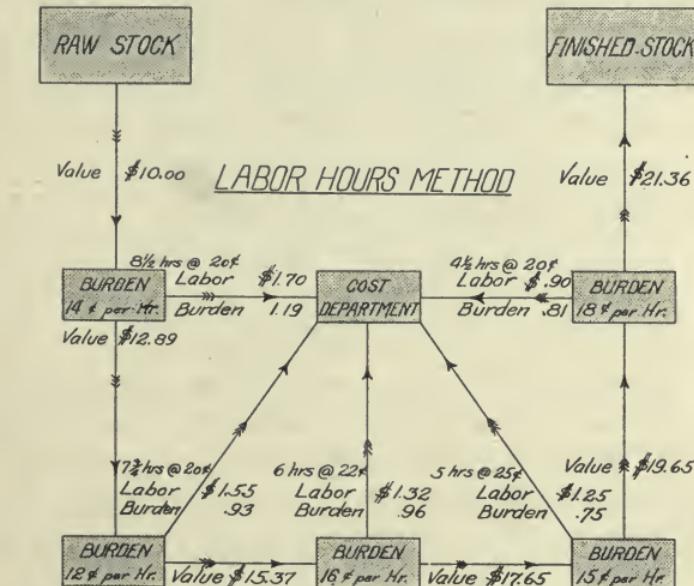


Fig. 7

Graphic Illustration of Labor Hours Method of Figuring Burden.

The diagram in Figure 7 shows how burden is apportioned to each operating department at so much per productive hour.

From the diagram it will be seen that Departments 1, 2, 3, 4 and 5 carry a burden rate of 14, 12, 16, 15 and 18 cents per hour respectively.

The raw material valued at \$10.00 comes into Department 1 where 8½ hours of labor are expended on it. The labor cost at 20 cents an hour is \$1.70 and the burden at 14 cents an hour is \$1.19. Therefore, when the material leaves Department 1, it is worth \$10.00 (raw material), plus \$1.70 (labor cost), plus \$1.19 (burden), or \$12.89.

An Illustration

Distribution of Burden · The partly finished product now worth \$12.89 is sent to Department 2 where $7\frac{3}{4}$ hours of work are done upon it. This increases its value \$1.55 (labor cost 20 cents per hour), plus 93 cents (burden), which is added to \$12.89 giving the partly finished product a new value, \$15.37.

In this way the product passes on through departments 3, 4 and 5, each one of which increases its value by so much labor cost and so much for burden, until it is turned into the Finished Stock Room worth \$21.36.

Direct Labor and Material Method **The Direct Labor and Material Method** of figuring burden is similar to the labor cost method, with the exception that it takes the total cost of labor and material as the basis instead of the total labor cost only.

The application of such method is practical only in those cases where the material constitutes the greater part of the direct cost of the product.

Necessarily it is an averaging method and if the labor cost predominates it is almost certain to give inaccurate results.

New Machine Rate Method **The New Machine Rate Method** is one that provides for charging labor and departmental expenses direct to a process or machine so as to show the total cost per hour, or per whatever unit of measure selected, of operating the machine or process. The expenses thus charged include both those directly and indirectly related to the process or machine in question.

Having found the total expense of operating a machine or process and having reduced this rate to so much per hour, the article is charged according to the time that the machine is employed upon it.

To operate this plan with the greatest success, all machinery must be grouped according to similarity of operation performed by it and then each job done by a machine is charged so much per hour according to the

nature of the operation performed. The rate for any stated operation is determined by close observation and exact prorating of the total departmental expense.

Each group of machines should be considered a department so that the total indirect expense can be more accurately distributed over the product. If the department includes radically different processes, it should be subdivided and the department indirect expense prorated over each division.

The more nearly alike the machine work or process is in each department, the more easily and accurately the expense can be allocated and the machine rate of burden or process rate of burden determined.

After this has been done, the total time of the workmen, the supplies and repairs are charged to the operations or processes. In addition to these items, charges are made for insurance, depreciation, rent and all other items in any way connected with the manufacture of the product. Ordinarily, these are indirect expenses, but with this plan they are treated as direct. Each machine or process is operated as nearly as possible like a complete little factory, being charged with the cost of labor to operate it, the cost of its repairs, superintendence, the rent of its floor space, the amount of power it takes, etc.

After finding the total direct cost of operating machines or processes, it is necessary to find the total number of hours that they are operated during a certain period of time, say a month. In this way, the cost per unit of measure, whether it be hour, pound or ton, can be calculated by dividing the total direct expense by the total number of units.

When the direct expenses have been figured, the general indirect expenses or those which are not directly related to any machine or process, are spread over the different departments on some scientific basis. These are added to department indirect expenses. This gives

General
Indirect
Expense

Distribution of Burden the total department indirect expense, which is divided among the machines or processes of that department according to the total number of hours or other units of measure.

The total indirect expense of a department for a certain period is then divided by the total units of measure for the same period and the rate thus obtained is applied to the product of the machines or processes. Thus all indirect expense for the department, as well as pro-rata of general expense, is included in the machine or process rate.

By this plan machines or processes absorb nearly all expenses ordinarily considered as indirect and gather them together so that they can be charged directly to the product at so much per hour or any other unit of measure.

When Collected When these costs have been collected and reduced to so much per hour or pound for each machine or process, it is comparatively easy to charge the product at this rate according to the number of productive hours or the number of pounds manufactured.

If "time" is the basis upon which the calculations are made instead of "quantity" the total indirect expense for a month is divided by the total number of hours that the machines or processes have been operated during the month and in this way the rate per hour is determined. This rate is then multiplied by the total hours each machine or process has been in operation, to get the total monthly charge for each.

Thus direct and indirect expenses are charged to a machine or process and reduced to a certain rate per unit of measure.

An Example For instance, if material for an article costs 75 cents and requires five hours to pass through a certain process at \$1.60 per hour, including direct and indirect expense, the total cost will be 75 cents plus \$8.00 or \$8.75. This example illustrates the fact that all expenditures (except for material) incurred by a machine or process can be

charged directly to the product. Thus the total cost of an article is easily figured when the price of the material, and time required by each machine or process through which it passes are known.

This plan is one of the most desirable because it gives a rate by which the greatest amount of expense of manufacture can be charged directly to the product in one item.

Where conditions are such that it can be used, the results will be as close to the actual cost as it is possible to get them.

The inventory value is obtained by multiplying the number of hours the article has been in process in each department by the respective rates per hour for each department. The totals are then recapitulated and to this grand total is added the cost of the material, giving the inventory value.

The Fixed Machine Rate Method is similar in some respects to the new machine rate method. The indirect expenses, however, are distributed differently by pro-rating them over the entire production on a percentage, or some other basis, instead of including them in the operating cost of the machine.

The rate of direct expense charge is calculated departmentally either from previous experience or from an analysis of current expenses and is distributed among the different machines operating in each department.

Charges are made to the cost of articles manufactured on the basis of this rate, the total of which is credited to the department expense account.

The general indirect expenses are not combined with the department indirect expenses as in the case of the new machine rate plan, but are distributed on the basis of a supplementary rate, which is applied to the entire product of the factory. Any method can be used for this distribution such as labor hours, labor cost, etc.

Distribution of Burden

Distribution of Burden The actual charges to be made against each machine are determined and then any difference between the estimated rate and the actual charges is added to or deducted from the general indirect expense and distributed by the supplementary rate. Thus, discrepancies between actual rate and estimated rate are adjusted.

This plan differs from the new machine rate in that it is based on an estimate and assumes a 100 per cent efficiency in running the plant. When the product is charged only with actual running time of machines, which is more likely to be 60 or 75 per cent of full time, the credit to departmental indirect expense increases rapidly, and makes the cost of production appear much larger than it actually is.

In order to equalize this effect, the difference between the indirect expense and the actual charges is deducted from the general indirect expenses before they are distributed by the supplementary rate. In case the actual charges exceed the estimated charges the difference is added. One of the faults with this plan is that the general indirect expenses will decrease according to the amount of machinery lying idle, and it is possible in this way for a major part of the machinery, if idle, to reduce the general indirect expense to nothing.

Faults of the Plan This is fallacious on its face, since the remaining active machinery must incur some general indirect expense. The possibility of eradicating general indirect expense is due to the inexact distribution and makes it practically valueless to the manufacturer.

This plan takes no account of idle machinery, dull times or machines which run only part of the time, and is therefore practicable only in very special cases where all machines are busy nearly all the time, and turn out a more or less uniform product.

The differences are accentuated because the rate is based on the assumption that the plant will run full time

instead of taking an average rate which indicates more nearly the true conditions in a factory. Distribution of Burden

The New Pay Rate Plan obtains the indirect expenses for each department separately, the general operating expense being first allocated to each department on the basis of direct labor costs before the percentage of departmental indirect expense is determined.

The departmental indirect expenses are not charged as percentages to the articles turned out by these departments but are added as separate rates to the wages of employes working in the departments, the amount to be added being based on the time the employe works on any one job.

This plan being applied departmentally does away with one of the chief disadvantages of an average rate plan, but it is applicable only where uniform wages obtain.

It is simple in that the calculations involve only the multiplication of the time an article is in process by the rate per unit of time, rather than a pro rata of indirect expense added to the products turned out by each department. Thus the plan has the advantage of saving considerable time, especially in a large plant. It is Simple

It likewise has disadvantages, even if it gives true cost, because it permits of no analysis of costs. All the figures are obtained in totals, thus depriving the cost department of a means to examine the cost of separate items and to suggest improvement in operations that will reduce cost.

Detailed information is exceedingly valuable to the manufacturer in order to point out leaks and weak spots. This plan fails to give it and for this reason frustrates one of the prime objects of an adequate cost system.

If the management doesn't particularly want an analysis of costs, this plan can be used advantageously providing conditions at the plant in question render it adaptable.

CHAPTER XV

Some Forms Used in Cost Systems

THE following pages are devoted to the description of typical forms used in connection with cost systems now in daily use in different parts of the country.

Since the variety of these forms is legion, we only attempt to give one or two of each kind, and these are given only for the purpose of presenting to the layman a general idea of their purpose and make up.

It is impossible to outline a cut and dried system which can be committed to print and safely used by anyone who desires to install a cost system. All that such a book as this can hope to do, is to outline important principles and give a few practical interpretations.

The conditions in different plants are so varied that the successful installation of a cost system requires special study by an expert, who has a comprehensive knowledge of costs and whose experience enables him to draw up forms suitable to the case in hand.

This remark may lead some men to doubt the business expediency of a system that requires considerable initial expense to set into operation, and much patience thereafter until it gets under way; but in reality, as testified by the experience of others, it is a matter of necessity, not expediency.

Therefore, in studying the forms, don't conclude because there happens to be an item left off that you think you need, or a couple of items added that you do not need, that there is no cost form in that particular department that can meet your requirements.

When you decide to set a system going in your plant, call in an expert cost man and with his assistance learn

in general what forms and data are necessary to operate ^{Some Forms} it effectively and you can then draw up forms that will suit your needs exactly.

A manufacturer who attempts to design his own forms unaided, will, nine cases out of ten, overlook some accounting detail that later will develop into one of great importance. This will necessitate a change in form or method of collecting the data, the cost of which will be as much perhaps as the service of an expert would have been in the beginning.

Every time a certain kind of information is gathered together it can, in all probability, be utilized in some other way to advantage, aside from the purpose for which it was originally collected. Every department of a cost system is inter-related with some other department. A cost accountant appreciates this fact and therefore can draw up forms for one branch of the accounting that will be sufficient to embrace any information collected in this branch and useful in a related branch. Hence the necessity for an experienced man.

A Purchase Requisition (Figure 8) is a memorandum ^{Purchase Requisition} on which is recorded the kind and quantity of a certain stock that is to be ordered, the date ordered, the order number, and similar information which varies in detail according to the plant where it is used.

Its purpose is to facilitate the transaction between the purchasing agent and the factory or stock room in regard to the purchase of material, supplies, etc.

If a certain department needs a new supply of material, which has been exhausted in the stock room, a purchase requisition is filled out either by the department foreman or stock room clerk and sent to the purchasing agent, who orders the stock and files it. The requisitions can be made in duplicate or triplicate, as occasion demands.

When a plant employs a regular stock clerk he can make out all requisitions for replenishment of stock

PURCHASE REQUISITION		
To	Purchasing Agent	No Date
QUANTITY	ARTICLES	DATE WANTED

Fig. 8
Purchase Requisition

PURCHASE ORDER.			
To Address Terms Place our Order No., Requisition No. and Car No. on all invoices.	Order No Requisition No Date		
SHIP ON OR BEFORE	DESCRIPTION	QUANTITY	PRICE

Fig. 9
Purchase Order

because he keeps a record of each kind and knows when the low mark of any particular stock has been reached. Some Forms

In special cases where it is necessary to have other parties make out the requisitions, such as specification clerks or superintendents, a copy should be sent to the stock clerk in order that he may look after its receipt, inspection and disposal and make the proper entries on his records.

A Purchase Order (Figure 9) contains all the necessary details of a bill of goods purchased by a factory, such as name and address of purchaser, order number, quantity and description of goods, shipment date, price and any other information of this nature that is deemed advisable.

As many copies can be made as desired, according to the requirements of the business. There should always be at least two copies, one for the purchaser to retain and one to be sent to the dealer from whom the goods are purchased.

If it is desired to keep a record of "stock ordered" according to kind, a copy of the order should be sent to the stock clerk that he may post to his stock record. All records of incoming material, however, should be kept separately from the records of "stock ordered."

The bookkeeper can also use a copy to advantage in checking up invoices, thus making his postings more promptly and relieving the purchasing agent of the detail of checking the invoices.

A Stock Received Report (Figure 10) embraces all information necessary to the proper recording of incoming stock. It contains such items as number, date received, purchase order number, quantity and description, price, by whom received, by whom shipped, etc.

This record is usually kept in a book, but since both the bookkeeper and purchasing agent should have copies,

Some Forms the disadvantages of this system are obvious.. It is awkward to pass a book around and also to locate the different items of incoming stock that have been recorded in it.

Loose Sheets The advantage of loose sheets lies in the fact that every department concerned with the receipt of stock can be supplied with a copy.

If the record is used only for advising the bookkeeper and purchasing agent, a form should be adopted that is as simple as possible. If it is to be used in connection with the stock record it must necessarily contain information that will enable both the purchasing agent and the stock-keeper to make up their records properly.

STOCK RECEIVED REPORT			
<i>No.</i> <i>Date</i>			
QUANTITY	ARTICLES	FROM	ORDER NO

Fig. 10
Stock Received Report.

Such items as weight, value, classification, bin number, etc., are generally necessary to the stockkeeper in order to facilitate posting to his stock records.

If a copy also goes to the bookkeeper, the account, Some Forms department, column, folio, etc., are indicated.

If transportation charges are heavy, provision should be made on the report whereby they can be added to the purchase price of the goods, thus giving the exact cost of the stock as delivered.

One of the chief advantages of a receiving report is that it makes the receiving clerk check up carefully and inspect the stock received.

This guards the management against faulty stock and paying for invoices in full where only a part of the order has been received.

In this way leaks are stopped, which in many cases have been very serious.

A Raw Stock Record (Figure 11) gives all the necessary information regarding the quantity of raw stock on hand. There is one card for each kind of stock. The typical stock record card contains such information as classification or kind, amount received, date received, price per pound or piece, amount delivered, balance, high and low water mark, and so forth.

The card serves as a perpetual inventory of every kind of stock, the amounts received being added to the old balance and the amounts delivered being deducted each time from the amount on hand, and a new balance extended.

All items posted to such records, both receipts and deliveries, should be taken from forms made out by responsible parties and checked, otherwise they will not reflect the true status of the stock on hand. Another reason why extreme care should be taken with these records is that, in case of discrepancies between the records and actual stock on hand, they cannot be accurately corrected. Therefore, separate forms should be used for each receipt of stock and for each requisition that comes from the factory. Never post from verbal information.

Fig. 11
Raw Stock Record

The cards should be checked periodically by the Cards Checked results obtained from an actual inventory and in case of Peri- errors, either by over-run or shrinkage, the cards should odically be made to agree with the actual amount of stock on hand after the cause for the discrepancy has been determined.

Unless checks are made and the reason for discrepancies is ascertained, the records cannot be relied upon.

As much care should be taken to keep the stock records in balance with the stock on hand as is taken by the cashier in keeping his cash book in balance with the cash on hand.

A Bill of Material (Figure 12) is an advice to the stockkeeper that the items shown thereon will be required for a certain job. It is sent to the stockkeeper as soon as the job is begun in the factory and he issues the material as needed, the foreman signing for each issue. The foreman also makes out a requisition for each issue of stock, in order that the proper entry can be made on the stock record card.

A Material Requisition (Figure 13) is used by the different departments of a plant for ordering raw material from the stock room and contains information which enables the stockkeeper to issue the required amount and to post it to the proper record card. Ordinarily the items are department number, date, job number, article, quantity, price, by whom received and by whom signed.

The foreman of a department or his clerk usually makes out the material requisition which is sent to the stock room and then to the cost department. In this way the cost of the material can be charged to the job and the proper entry can also be made on the stock record card.

Other forms of material requisitions are ruled to accommodate a number of different items that go into a

BILL OF MATERIAL.					
REQUIRED BY			DATE	DEPT NO	ORDER NO
CLASSIFICATION	ARTICLE	QUANTITY	RATE	AMOUNT	RECEIVED BY

Fig. 12
Bill of Material

MATERIAL REQUISITION.					
Order No	Symbol	Date	Dep't No	Acc't No	
QUANTITY	DESCRIPTION			VALUE	
Delivered to		Delivered by		Foreman	

Fig. 13
Material Requisition

single job. These are used when it is not desirable to issue a separate ticket for each kind of material, the whole lot being ordered at one time.

There are a multitude of forms from which to select. The one in the illustration, Figure 13, is used where only one kind of material is ordered on a single requisition.

A Production Order (Figure 14) is a memorandum issued by the factory manager when a job is to be started, and gives specifications relating to it. It contains such items of information as order number, date wanted, date completed, description of product to be manufactured, kind of material, amount, value, etc. This serves the factory superintendent as a written statement of what he is to manufacture and eliminates verbal orders.

There are numerous forms of production orders which are generally divided into two classes. The first class is used when it is desired only to regulate the manufacture and record it, and the second class where it is necessary, in addition to the above, to send information regarding the job to the cost department.

In the first class, only the data relating to the manufacture of the goods is necessary, but in the latter such items as workmen's time, cost of operations, quantity of material and cost should be recorded.

When an order necessitates operations that must be performed by different departments simultaneously, sub-production orders are issued outlining the work to be done by the respective departments.

A copy of the order should be sent to the stockkeeper so that he can properly superintend the disbursement of raw material. The order assures him of the correctness of the material requisitions that are sent in by the different departments working on the job.

The Time Ticket (Figure 15) is a memorandum that shows how much time a workman has spent on a job, and it is used as a means of ascertaining labor cost of jobs,

Production
Order

DEPT		PRODUCTION ORDER.			No DATE	
DATE	DESCRIPTION	QUANTITY	PRICE	AMOUNT		
DELIVERED TO		AUTHORIZED BY				

Fig. 14. Production Order

TIME TICKET		DEPARTMENT		
WORKMANS NAME	DATE	WORKMANS No.		
ORDER No.	SYMBOL	Box No.	No. PIECES.	ACCOUNT No.
OPERATION		TIME	RATE	AMOUNT
			HOURLY	HUNDRED DOLLARS CENTS
REMARKS				
TIME STARTED		TIME FINISHED		
FOREMAN'S O.K.				

Fig. 15. Time Ticket

preparing comparative records by workmen, furnishing data for adjusting piece rates, distributing labor cost by accounts, departments or workmen, checking pay rolls and so forth.

■ The information given on a typical time ticket, is, workman's number and name, date, time job is begun, time job is finished, pieces finished, operations and all other information required by the conditions under which the goods are manufactured.

In a well regulated factory, the foreman gives a time ticket to every productive workman when he begins a job and records thereon the time started. This is done either by hand or by a time stamp. When a job or operation is finished, the foreman records the time finished and starts the man on another job, issuing a new ticket with the starting time for the second job or operation. Or the time of starting the second job or operation may be noted on the old ticket, according to the kind of ticket used. The time ticket may be issued for the operation, the job, the day or for a series of jobs that cover several days. On this account a great variety of time tickets is extant, but the object of them all is practically the same, viz., to indicate how much time each man is employed on a job or operation and to give the manager a line on his efficiency.

Since time tickets embrace information that is related directly to cost, the kind of ticket will depend, in large measure, upon the kind of cost system in operation.

In some factories they use time tickets as shown in the illustration. A separate ticket is used for each operation. These are adequate for the day rate and piece rate systems of paying men and give the cost department information whereby the cost of each operation can be posted on comparative records, together with information that indicates the efficiency of the men. This feature is brought out clearly in the description of the Cost System given in Chapter XIX.

Some Forms
A Card in Use

Fig. 16
Pay Roll

A Pay Roll (Figure 16) is a record showing the total amount of time worked by each employe and the amount of money he has earned. Some Forms

Pay Rolls are divided into two general classifications, one of which contains all the workmen's time and earnings on separate sheets, and the other includes this data on one sheet.

The forms used in the first class give such information as name, date, order, operation, article, number of articles made, time, rate and amount. One individual pay roll serves for a number of jobs.

The forms used in the second class contain columns for employes' names, time, rate, amount and so forth. The total time of each man for the pay period is recorded in the time column and the amounts are extended. Sometimes a separate column is used for the daily time of each man, there being as many columns as there are days in the pay period. A total of these daily amounts at the end of the period is carried into the total time column.

A Production Report (Figure 17) gives a departmental record of the various articles made during a certain period of time, usually a week. Production Report

The typical report is ruled in columns, in which are recorded the order number, kind of article, operation, number made, number rejected, etc. If the report is used in connection with figuring costs it contains columns for time, rate of pay, material cost and labor cost. Some forms have columns giving the daily record of production for a week while others give only the totals for a week.

In brief, this report is used for the purpose of laying before the management, weekly, the amount and cost of production for every department. It can also be used in the finished stock room for posting to the finished stock records.

It is as necessary to keep a record of the finished product or parts as it is to keep a record of raw stock.

PRODUCTION REPORT

PRODUCTION REPORT

O. K. BY

RECEIVED BY

Fig. 17 Production Report

The Finished Stock Record (Figure 18) gives the article or part, the date, the classification, high and low water mark, the amount on hand, the amount disposed of, and the balance.

The object of this record is to inform the finished stock keeper at all times as to the quantity of each kind of stock on hand. By extending the balance after each issue of finished parts or shipment of finished product, he can tell immediately whether or not it has reached the low water mark. If the supply is low he can notify the factory manager, who in turn starts an order for a new supply. This information is especially valuable where staple parts are kept in stock and are drawn on continuously for erection into a finished product.

The information regarding receipts of finished stock can be taken from the production reports and the disbursements can be obtained either from requisitions or from sales sheets or shipping orders.

From time to time, as the stock of parts runs low, a physical inventory should be taken and the records adjusted to agree with the stock on hand.

A Cost Record (Figure 19) shows the cost of each part or article manufactured and includes the direct labor cost, the indirect labor cost, the cost of material, the name of the article or part, the operation, the quantity finished, etc.

This information is arranged in column form, the items of cost being recorded opposite each operation. A footing of the material and of the direct and indirect labor cost columns, on the completion of the last operation, gives the total of each of these costs for the completed part or article. A recapitulation of these totals gives the total cost.

Some cost records are ruled to show comparative costs and defective work, also the selling price and gross profits.

Finished Stock Record

Cost Records

FINISHED STOCK RECORD.										No Maximum Minimum	
ARTICLE		AMOUNT RECEIVED			AMOUNT WITHDRAWN			BALANCE			
DATE	QUANTITY	RATE	AMOUNT	DATE	QUANTITY	RATE	AMOUNT	DATE	QUANTITY	RATE	AMOUNT

Fig. 18

ORDER NO.	COST RECORD.			ACC'T NO.
DATE STARTED				DATE FINISHED
DESCRIPTION				
NO. PC'S STARTED		NO. PC'S DESTROYED		NO. PC'S FINISHED
MATERIAL				
QUANTITY	KIND			AMOUNT
LABOR				
HOURS	AMOUNT	BURDEN	TOTAL	
REMARKS			TOTAL COST	
AVERAGE COST PER				

Fig. 19

Fig. 20

Cost Record of Operations. Reverse side of Cost Record Card shown in Figure 19.

Fig. 21
Cost Record

FACTORY EXPENDITURES.		CURRENT MONTH		CURRENT FISCAL YR. TO DATE	
NAME OF ACCOUNT		AMOUNT	TOTAL	AMOUNT	TOTAL
MATERIAL					
LABOR	INDIRECT EXPENSE				
LABOR	SUPERVISION				
SUPPLIES					
MAINTENANCE					
LIGHT, HEAT & POWER					
TAXES					
INSURANCE					
PRINTING					
STATIONERY					
SALARIES					
DEPRECIATION					
INCIDENTAL					
TOTAL FACTORY EXPENDITURES.					
INVENTORY (BEGINNING OF PERIOD)					
TOTAL COST OF GOODS					
INVENTORY (END OF PERIOD)					

Fig. 22
Factory Expense Statement

ACCOUNTS	DEPARTMENTS						DATE
	1	2	3	4	5	6	
FACTORY EXPENSE STATEMENT							
DIRECT							
Purchases							
Freight, Cartage etc.							
Labor							
Total							
INDIRECT							
Light, Heat, Power							
Rent							
Insurance							
Printing							
Storage							
Maintenance							
Depreciation							
Incidentals							
Total Expenditures							
Percentage							
Inventory (beginning of period)							
Total							
Cost of Sales							
Inventory (end of Period)							

Fig. 23
Factory Expense Statement

The reverse side of the same Cost Record Card is so ruled that the cost by operations can be recorded. This affords good data for comparative purposes, especially as between day and piece workers employed on the same kind of work. (See Figure 20.) Another form of Cost Record is shown in Figure 21.

There is perhaps a greater diversity of forms for this record than for any other, a distinct form being necessary for practically every individual plant.

The form of this record, as well as that of other records already enumerated, depends entirely upon the cost system that is used. It is because of this inter-relation between the make up of the form and the cost system that the services of a cost expert are so necessary.

To the mind that has never made a study of costs this statement is hard to understand, but it is nevertheless true. A satisfactory cost system cannot be installed unless it has behind it a man thoroughly acquainted with the subject and all of its ramifications.

A web rotary printing press is a complicated piece of machinery to the lay mind, but note how smoothly it runs and the beautiful work it turns out.

Likewise a complete cost system appears a hopeless mass of detail to the uninitiated, yet when set in motion by the man who knows, it becomes a great satisfaction and safeguard to the management of a plant.

At the end of the month a statement should be prepared that shows the Expenditures of the Factory by accounts. Factory
Expendi-
tures

The illustrations in Figures 22 and 23 are typical statements of this kind.

They give an analysis of expenses relative to factory operation, including amounts expended for direct and indirect labor and material. Forms may be used on which the expenditures for the factory can be summarized either as a whole or by departments.

Fig. 24. Cost Record of Sales

The cost price of the goods sold during the month, Some Forms the inventory at the beginning and end of the month, the amount of finished goods on hand, amount in process and so forth, can also be recorded.

The statement may be made comparative by ruling columns for the expenditures during the corresponding months of the previous year.

An ordinary ledger may be used for keeping these accounts, but a regular factory ledger as described later, is better adapted to the purpose.

The tabulation of items to this statement is nothing more than copy work. By placing the statement in the adding machine carriage, the items can be added and listed very quickly. The advantage of using a machine for this kind of work lies in the fact that it does it more rapidly than it can be done by hand and the totals are always correct.

A Cost Record of Sales (Figure 24) shows an abstract of sales made during the month and a classification of the different articles sold. It may be ruled to include cost of labor, material and burden.

Cost Record of Sales

Some of the records are ruled so that individual sales can be posted and others are ruled for daily totals.

The adding machine is very useful for tabulating the items on this kind of sheet.

An Inventory Record is a record that shows the total amount of stock on hand and its value.

The illustration in Figure 25 is a typical inventory sheet that gives the quantity, price and value of every kind of raw stock, semi-finished material and finished product on hand at the close of the year.

In preparing inventories, care should be taken to include goods in process.

Where the inventory is used in connection with a stock and cost system it should be divided into raw material, goods in process and goods finished.

Some Forms The amount and cost of raw material should be entered on stock cards or sheets according to kind. The posting is made in the balance column, which, if the stock cards have been properly kept, will agree with the balance obtained by deducting the last amount of raw material issued.

INVENTORY OF		Raw Stock Stores		DATE	Dec. 31	PAGE	1
FLOOR OR DEPT		Dept - 31		CALLED BY			A. G. Smith
ENTERED BY W. H. Piper		PRICED BY A. Jones		EXTENDED BY			T. Murphy
DESCRIPTION		QUANTITY	PRICE	EXTENSION			
Key Buttons Jan 6 Dec		15.78	13.50	213.0	*		
Black 1-9	Blue	20.00	13.50	270.00			
White 1-9		10.00	13.50	135.00			
Black 1-9		851.97	13.75	11714.6			
White 1-9		406.15	13.75	558.46			
Red 1-9		133.68	13.75	183.81			
Blue 1-9		52.96	13.75	72.82			
<hr/>							
White 10-11		15.03	13.50	202.9			
Black 10-11-12-13-14		30.95	13.75	425.6			
Black 1-9		51	13.75	.70			
Black Black $\frac{1}{4}$ hole		4.29	12.50	53.6			
Blue		5.53	12.50	69.1			
Red		212.01	12.50	2650.1			
White		7.29	12.50	91.1			
Blue regular slot		1.19	13.75	1.64			
White		62	13.75	.85			
Black		2.98	13.75	4.10			
Red		1.99	13.75	2.74			
Black		34.89	13.50	471.0			
<hr/>							
				281922*			

Fig. 25

Inventory of Raw Stock

The goods in process, their cost and last operation performed upon them, should be entered on a cost sheet by order numbers.

The quantity and cost of goods finished should be entered on the finished stock record.

CHAPTER XVI

Final Disposition of Cost Figures

Up to this point we have taken into consideration the various elements that constitute cost of production, together with numerous modifications that arise under varying conditions.

First we explained how wages are paid, then how inventories are taken, how raw stock is handled, how burden is distributed and the kinds of forms used in keeping the cost records.

This naturally leads to the inquiry, "What is done with the cost figures after they have been collected?"

They must be posted either as debits or credits to certain accounts. Therefore, it is necessary to design a System of Distribution that will provide accounts to which all productive and non-productive labor, material, general and other expenses can be charged. It should be arranged so that charges can be made against each department and also against any shop or production order, so as to give an accurate analysis of cost.

All material requisitions and labor tickets pertaining to a production order should bear the order number, and on the labor tickets the department number should also be recorded. If the order is for plant repairs or betterment, both requisitions and labor tickets should bear the number of the department for which the repairs are made or the improvement done. By thus identifying the labor ticket or requisition for material with a job and department, it becomes comparatively easy to distribute the cost to the department account and to the job.

As has been pointed out before, it is absolutely necessary to draw a distinct line between the selling and manufacturing end of a business. The cost to make

Final goods is one thing, the cost to sell is quite another, and if Disposition of this fact is borne in mind from the outset a great amount Cost of confusion will be avoided.

Figures

The following "Card of Accounts" is typical of a large manufacturing business and is so arranged that all accounts, including selling, manufacturing and general expense items, are segregated into their proper groups. A "card" for a large business has been selected because it shows what is necessary for accurate accounting in big concerns and at the same time includes all of the fewer accounts which are necessary to smaller concerns. For instance, out of the forty-one general accounts shown, a small concern could select possibly fifteen or twenty which would answer all its requirements.

All of the general accounts, shown on this card, that present any difficulty in understanding are described briefly, so that a little study of them should give the reader a very clear idea of what each one is intended to include and how it is used.

CARD OF ACCOUNTS

CAPITAL ASSETS

1—Patent Account

2—Good Will Account.

3—Real Estate and Building Account.

4—Special Tools Account.

5—Plant Machinery and Equipment Account.

This includes all machinery, shafting, pulleys, belts, standard bench tools, boilers, piping, ventilators, motors, etc.

6—Patterns and Drawings Account.

This includes all patterns, drawings and blueprints necessary to the manufacture of the product.

7—Inventions Account.

This includes cost of experimental work and development of new features.

8—Factory Furniture and Fixtures Account.

This includes all furniture, fixtures and apparatus necessary to the factory.

9—Office Furniture and Fixtures Account.

This includes all articles of this nature pertaining to the general office equipment.

FACTORY INVENTORIES

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10—Raw Material and Supplies Account.

This includes raw stock, millwright and small tool stores, packing cases, etc., which may be treated as separate accounts where the nature of the business demands it.

11—Finished Parts Account.

This includes all finished stock and accessories which can be treated as separate accounts when necessary.

12—Miscellaneous Inventory Account.

This includes scrap, inventory adjustments, dismantled machines, etc., which may also be treated as separate accounts.

13—Work in Process Account.

This includes all parts and sections of a product that are in process of construction, together with all labor and material expended on them.

14—Experimental Work in Process.

This account includes all labor and material expended on experimental work.

FACTORY OPERATING ACCOUNTS

15—Operating Expense Accounts. (Distributed over all Burden.)

These accounts consist of such items as building and machinery expense, electric light, power and heat, a separate account being kept for each.

16—Factory Production Expense Accounts. (Distributed over all Production Department Burden Accounts.)

These accounts cover such items as inspectors' school, nickel plating, finished stock, stock order and standard departments.

17—General Factory Expense Accounts. (Distributed over all Burden Accounts.)

These accounts cover factory managers and foremen, purchasing department, janitors, receiving and raw stock departments, time and cost departments, tool supply department, printing and stationery, replacement of tools and machinery, drayage and miscellaneous freight and express.

Under each of the Factory Operating Accounts are the following sub-accounts: Salaries, labor supplies, repairs, light, heat, gas, furniture and fixtures, insurance, taxes, etc.

FACTORY BURDEN ACCOUNTS.

18—Repair and Construction Burden Accounts.

These accounts cover such items as millwright and carpenter departments, tool designing, inventions, tool and pattern making, experimental work, etc.

19—Manufacturing Department Expense Accounts.

These accounts cover all of the various manufacturing departments, testing, inspecting, cleaning, assembling, polishing, japaning or painting and shipping departments.

Under each of the Manufacturing Department Expense Accounts are sub-accounts for salaries, non-productive labor, supplies, repairs, light, power, gas, heat, overtime allowance, etc.

20—Pay Roll Accrued Account.

21—General Ledger Account.

INVENTORIES OF FINISHED PRODUCT.

22—Finished Product at Factory Account.

23—Finished Product with Agents' Account.

24—Models Account.

25—Advertising and Stationery Stores Account.

26—Accessories to Product Account.

CURRENT ASSETS AND LIABILITIES.

27—Accounts Receivable Accounts.

These accounts cover agents' accounts, miscellaneous personal accounts, reserve for doubtful accounts, accrued interest, etc.

28—Bills Receivable Accounts.

These accounts cover bills receivable and reserve for doubtful notes.

29—Cash Accounts.

These accounts cover cash in bank, petty cash, postage fund, paymaster's fund, etc.

30—Capital Stock Accounts.

These accounts cover capital and treasury stock.

31—Accounts Payable Accounts.

These accounts cover such items as audited and unaudited vouchers, accrued taxes, bills payable, prospective commissions, cash on unfilled orders, reserves for depreciation, etc.

32—Surplus Accounts.

These accounts cover profit and loss, surplus and dividends.

SALES AND COST OF SALES.

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33—Sales Accounts.

These accounts cover sales of the product and accessories, together with cancellations and exchanges.

34—Cost of Sales Accounts.

These accounts cover all costs for selling the product and its accessories.

35—Other Income Accounts.

These accounts cover the income from such sources as rents, interest, discounts and miscellaneous income.

SELLING AND DISTRIBUTING EXPENSES.

36—Commission Account.

37—Repairs Account.

38—Allowance Account.

39—Freight and Express Account.

40—Other Accounts.

These accounts cover all expenses incurred for general sales department, agencies, advertising, etc.

There are sub-accounts for each of these accounts, such as salaries, supplies, postage, traveling expenses, telephone, telegraph, taxes, insurance, rents, conventions, etc.

GENERAL AND ADMINISTRATIVE EXPENSES.

41—Administrative and General Office Accounts.

These accounts cover expenses for the president, general manager and assistant, together with expenses for the various administrative departments.

There are sub-accounts for each of these, covering officers' salaries, office salaries, supplies, postage, heat, light, power, taxes, insurance, depreciation, repairs, traveling expenses, donations, janitors, etc.

Where sub-accounts are used it is customary to number them from "1" upwards and to designate them by writing the general account number followed by a dash and the sub-account number. Thus, referring to the "Card of Accounts" at the division headed "Factory Burden Accounts," the salaries paid in the manufacturing

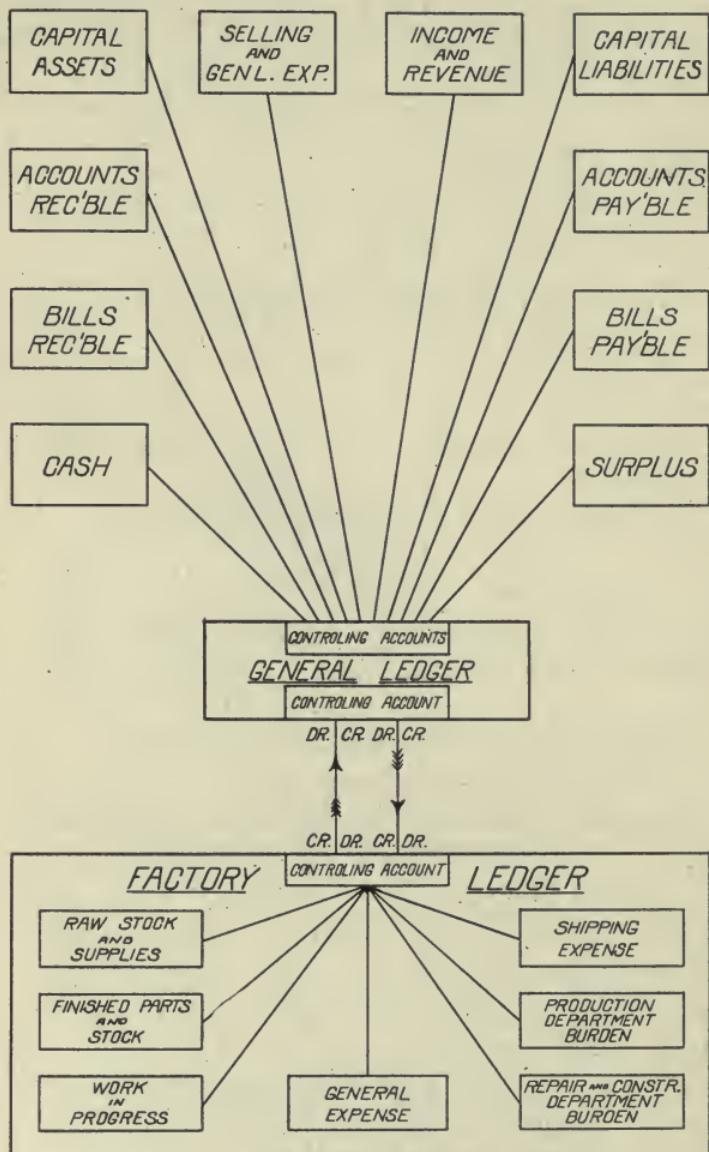


Fig. 26
Diagram of Factory Accounts.

department would be designated by account No. "19-1," the "19" referring to manufacturing department and the "1" referring to "salaries," which is the first of the sub-accounts.

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Since the factory department of a manufacturing business is a very important part of the establishment, it is customary to segregate all items pertaining strictly to the factory into a factory ledger. This ledger is divided into groups of accounts adapted to the line of business for which it is used.

For the purpose of illustration, the following outline of a typical factory ledger is shown. By careful study it will be seen that several of the accounts in this factory ledger correspond to the factory accounts mentioned in the general "Card of Accounts." All other accounts for the selling and administrative end of the business are kept in the general ledger or ledgers.

FACTORY LEDGER ACCOUNTS

Group 1—Controlling Account. General Ledger.

Group 2—Raw Stock and Supplies Account.

a. Raw Stock Stores.	c. Packing Cases.
b. Millwright Stores.	d. Small Tool Stores.

Group 3—Finished Parts and Stock Account

Group 4—Work in Process Account

Group 5—General Expense Account

a. Building Expense.	e. Heating.
b. Machinery Expense.	f. General Tool Expense.
c. Electric Light and Power.	g. General Factory
d. Gas, Fuel and Lighting.	Expense.

Group 6—Repairs and Construction Department Burden Account

a. Machine Shop.	d. Pattern Shop.
b. Tool Making Shop.	e. Electric Shop.
c. Carpenter Shop.	

Group 7—Production Department Burden Account

a. Milling Machines.	e. Assembling.
b. Screw Machines.	f. Erecting.
c. Punch Presses.	g. Inspecting.
d. Drill Presses.	

Group 8—Shipping Expenses.

Final Disposition of Cost Figures The factory ledger bears the same relation to the general ledger as the various subsidiary ledgers or accounts bear to the general ledger.

A general scheme of this relation is illustrated by the diagram in Figure 26; in which the factory ledger and subsidiary accounts are represented as separate books. It is not necessary, however, to have separate books, except in large manufacturing concerns where it is more convenient to do so. In a small concern the various subsidiary accounts, including the factory ledger accounts, may be subdivisions of the general ledger, although it is generally desirable to have a separate ledger for factory accounts.

Beginning with the Factory Ledger in the diagram it will be seen that the typical accounts comprising this ledger are, Raw Stock and Supplies, Finished Parts and Stock, Work in Process, General Expense, Repair and Construction Department Burden, Production Department Burden and Shipping Expense.

All of these accounts converge into a Factory Ledger Controlling Account to which their total debits or credits are posted and which forms the door of exit, so to speak, from the Factory Ledger. The corresponding door of entry to the General Ledger is a similar Controlling Account, with the exception that the debits and credits are the reverse of the debits and credits in the Factory Ledger Controlling Account.

The various subsidiary ledgers for the general accounts also have corresponding controlling accounts in the general ledger similar to the one illustrated for the Factory Ledger. In this way the total debits and credits for all subsidiary accounts are gathered into the general ledger. But since this book treats principally of factory costs, our attention will be devoted to the Factory Ledger.

The first account covers raw stock and supplies used in connection with the factory output and all other

material in the nature of factory supplies. This account is debited for all stock and supplies received into the factory and credited for all that is used. The credits are obtained from the material and supply requisitions.

The account for finished parts and stock covers finished manufactured parts and all stock which is purchased in finished condition, but which is only a part that goes into the finished product. It is usually known as semi-finished stock. This account is debited with all receipts and credited with all disbursements made on requisitions for finished parts or stock.

The Work in Process account covers all unfinished parts or products in the factory, being debited with all labor, burden and material used, and credited with finished parts or products. This account is the most active of the factory accounts since practically all the material and labor expended is controlled by this account.

The General Expense Account covers such items as are shown in Group 5 of the Factory Ledger "Card of Accounts," and is debited with all general expense items and credited with the total amount that is distributed between the Productive Department Burden Account, Repair and Construction Department Burden Account and Shipping Expense Account.

The Repair and Construction Department Burden Account covers such items as are shown in Group 6, and is debited with indirect labor, supplies, repairs, general expense, etc., and credited with the total amount distributed to Department Burden Accounts on the basis of productive hours. (This basis is used, of course, in only those factories using the labor hours' method of Burden distribution.)

The Production Department Burden Account covers items as shown in Group 7, and is debited with indirect labor, supplies, repairs and general expense and credited with the total amount distributed to work in process.

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tion of
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Final Disposition of Cost Figures

The Shipping Expense Account covers all items incidental to shipping, and is debited with all such expenses, exclusive of freight and express, and credited with the total amount that is distributed to the cost of the product shipped.

While the above explanation of a factory accounting system is more or less in skeleton form, it gives a good general idea of the system of distributing the numerous debit and credit items and shows how the results are finally disposed of.

In one of the following chapters, in which the routine and statistical phase of a cost system is treated, are described the methods for handling the cost data with a view to finding out the exact cost of each unit of the product.

CHAPTER XVII

Cutting the Cost of Keeping Costs

“**S**EE that roomful ‘of clerks,’ ” said the manufacturer with a sweep of his hand, as we looked over the cost department of his factory, “that costs us \$15,000 a year.”

There’s the rub—the cost of running a cost department is a constant irritation to the man who has yet to realize that it costs to be safe. Yet this premium which must be paid to be safe—to know that you are getting the product at the right cost—is nothing but the insurance premium in another guise.

Pay it the business man must—either in salaries to cost keepers or through decreased profits on sales. But too frequently he does not handle his cost keeping work with that concrete sense of values which he shows in handling the making and selling of his product.

Whether producing figures or frying pans, the principles are the same.

A cost expert of national reputation for his successful handling of many knotty cost-of-production problems, said to a committee of the stockholders of a company in trouble:

“One of the objections raised against cost systems is that after *incurring considerable expense* incident to the inauguration of such a system, some manufacturers have discontinued the use of the system after a comparatively short period. There can be but two explanations given in such a case. The first one is, that the management did not comprehend the system and its underlying principles. The second reason is, that the system was defective in design, and the underlying principles were either not basic, or else wrongly applied. Defects of this character in a system usually *involve such*

Cutting *an amount of clerical labor* as to make the system, to a great extent, impracticable. They are traceable to two principal causes, one of which is that the one *designing* the system attempts to figure out a plan of cost finding from a bookkeeping standpoint, without any reference to, or knowledge of, factory conditions governing the manufacture of the product. The other cause is due to the fact that those in the immediate charge of the enterprise are unfamiliar with accounting and the preparation of statistics, and are unable for this reason to see at the outset the impractical features contained in the system. In other instances a half-hearted effort is made to inaugurate a system, and the slightest resistance eliminates the desire of the manufacturer to continue his plans along these lines, merely because a few difficulties are encountered during the first few days or weeks."

There is no doubt but that the cost of conducting a cost system is important.

Common Sense But let us apply the same common sense we use in solving the problem of gaining efficiency in a factory, to the lowering of the cost of handling the statistics and facts in an office.

Let us use machines for the work that machines can do more quickly and accurately than men.

A great economist has said that "a man should not be kept at any work a machine can do better."

Acting on that dictum has made the commercial world over again in an hundred years.

We have come to accept it everywhere but in our offices. There we still keep production down to a hand-work basis. We take men out of the factory by adding automatic machinery, and we add new men to the office force to take care of the increased work and output.

We see signs of a change.

It has been slow.

When business men realize what the Burroughs means to all the figure-handling work of a business, the machines will become as common as typewriters. Cutting the Costs

It is just plain everyday common sense that it should be so.

In any cost department where figures have to be handled, this labor-saving machine should be introduced. The cost department must employ a number of clerks for the purpose of handling the figures, statements and statistics. These statistics are made up from figures gleaned from many sources. These figures must be recapped by special headings and then statistical summaries made from these recaps.

There are two chances of error in every handling of figures:

First—In putting down the figure.

Second—In making additions, multiplications, subtractions and divisions.

You can't afford to take chances. Where the fraction of a cent—in such a business as a foundry, for instance—may be the difference between profit and loss, work must be right. The manager who has his costs checked and counter-checked for possible error, is really making the very figures by which he gets his costs, cost him from twenty-five to sixty per cent more than they should. It doesn't matter how simple and efficient the cost system, without a Burroughs, it is more expensive than it should be. Taking Chances

If the work in any cost department were figured out on a piece-work basis, it would be easy to find out just how much it costs to handle every item.

You pay the clerks on a basis of time—by the week or month. It is obvious that a rapid, accurate man can handle a greater amount of work to a satisfactory conclusion than a slow, inaccurate man. It is right here that the Burroughs Adding and Listing Machine demonstrates its utility in any cost department.

Cutting the Costs The regular Burroughs can accurately handle 160 items a minute. There is probably not a clerk in your employ who can set down figures and accurately add them up at the rate of 40 a minute. Therefore the machine can work four times as fast as your most expert clerk. Remember, the Burroughs prints the figures and has a total just as soon as the figures appear on the sheet.

But the average operator in an office cannot handle the machine as fast as it will operate. Let us say, for instance, that the clerk can handle a machine at the rate of 80 items a minute, which means that the machine and the operator are twice as fast as the fastest clerk without the machine. The gain in time, therefore, in handling 1,000 items—and leaving out of consideration the vital matter of accuracy—is one that can very quickly be reduced to a dollars and cents basis. If you would check the items your clerks handle in every operation for even a single day, you would realize just how much this machine means.

We Know We know cost departments with these machines where the daily increase of work has been handled through a period of six months to a year without increase in the force. In other places, where the work was more stationary in volume, the work has been handled more quickly and accurately in a third to a half less time.

In short, the Burroughs means a gain in money-saving efficiency in every line of work that the cost department handles, just as an automatic machine means a saving in time and a gain in efficiency in the factory. You cannot afford to pay men to handle figures that a machine can handle better, because it can handle them more quickly, and with less man aid; better, because it is absolutely accurate, while men are but relatively so; better, because it furnishes you with neatly printed sheets; better, because

it is cheaper; better, because it frees your best men from drudgery, and lets them do the thinking, planning, doing of things that mean bigger results to the business.

Bear these facts in mind when considering the cost problem in your business. It is the solution of how to get the cost facts with the smallest expenditure of time and work.

CHAPTER XVIII

The Burroughs Machine and How it Helps the Cost Keeper

BEFORE entering upon a description of the actual operation of a cost system it is well to describe briefly the machine which plays such an important part in the economical handling of the hundreds of items that must be accounted for.

The Burroughs Adding and Listing Machine is a mechanical device which adds, lists and tabulates numbers and amounts more quickly and accurately than the work can be done by hand and mind.

It is something like a typewriter, only a little heavier, more compact and box shape, as shown by the illustration, and it is operated by a handle at the side or by a touch bar connected with an electric motor. See Figure 27.

The keys on top are arranged in columns on a sloping keyboard. The mechanism is so constructed that the depression of a key, which stays down until released, does nothing more than set the machine. It is necessary to pull the handle or touch the bar before the item thus "set up" can be listed and added. The advantage of this is that it permits the operator to correct a wrong item when necessary before it is added and listed.

When an item is set up incorrectly, the correction button marked "C" restores the keys to normal position, otherwise the handle pull restores them automatically after the item has been added and listed.

The button marked "C" (Figure 27) is a general correction button and is used when the whole item is to be corrected. The row of buttons at the top are individual column correction buttons and are used for correcting an error in one or more figures of an item.



Fig. 27

Keyboard View of the Burroughs Duplex Cost Machine Electrically Operated.

Time	Amount
	Dep't 18#
	*
8 3/4	2.35
8 1/4	2.01
1 2	3.79
6	1.50
1 6 1/2	4.77
1 6 3/4	4.93
1 0	3.00
7 8 1/4	22.35*

Fig. 28

Example of Cost Machine work showing how Time and Earnings are added and listed simultaneously.



Fig. 29

Three-quarter View of the Burroughs Cost Machine
Electrically Operated.

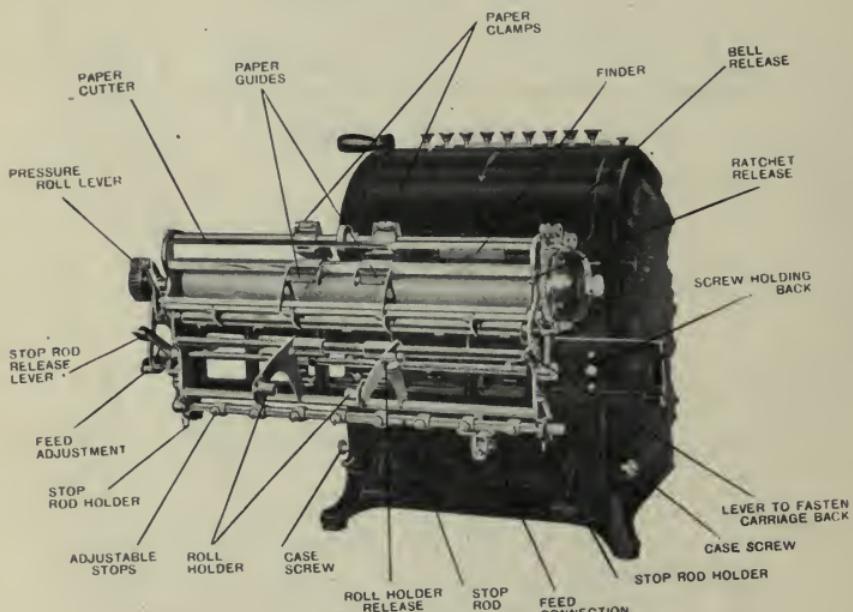


Fig. 30

Rear View of the Burroughs Machine Showing the Carriage
and its Principal Features.

The button marked "E" is an eliminating button. When it is depressed in connection with an item, the item can be listed but not added and the symbol (#) printed at the side of it will indicate this fact. This button is used when department or account numbers are set in at the top of a list of items. Figure 31 illustrates this feature.

The
Burroughs
Machine

Dep't	1 6 #
	* 1 2 4 2 s
2 2 4	2 2 4
2 5 4	2 7 5
2 4 5	3 1 2
3 2 2	2 6 5
1 9 7	2 1 0
1 2 4 2 s	2 5 2 8 *

Fig. 31

The button marked "S. T." is used for taking sub-totals. When it is depressed and the handle is pulled, the amount which had been accumulated in the machine is printed, but not cleared from the machine. This is shown in Figure 31, the sub-total being printed at the bottom of the first column and carried forward to the top of the second column.

The button marked "Total" is used for getting totals. When it is depressed and the handle is pulled, the total in the machine is transferred to the paper and the machine is cleared.

A star (*) is printed opposite all totals and an (s) opposite all sub-totals in order to distinguish them from other items and from each other. The total button should always be depressed and the handle pulled before an addition is begun. Thus any amount that may be in

SUMMARY OF PIECE WORK DAILY TOTALS

FOR WEEK ENDING 12-11, 1909

DEP'T	FRIDAY	SATURDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	TOTAL
1	6 6 2 4	6 5 3 0	5 3 5 0	6 1 2 3	7 1 3 0	6 3 5 6	3 8 1 1 3 *
2	2 7 5 6	2 2 4 0	2 4 6 0	2 9 5 6	3 0 0 0	3 1 3 0	1 6 5 4 2 *
3	8 3 4 5	7 5 0 0	6 2 4 0	8 4 0 0	8 3 5 0	8 2 5 6	4 7 0 9 1 *
4	1 4 2 4 5	1 3 2 4 5	1 5 5 5 0	1 4 4 0 6	1 5 3 5 5	1 5 2 4 5	8 8 0 4 6 *
5	1 5 4 6 7	1 6 3 0 5	1 3 9 5 6	1 5 0 3 0	1 6 4 6 0	1 5 5 7 8	9 2 7 9 6 *
6	6 3 5 6	5 5 5 7	5 3 0 0	6 1 3 5	7 1 0 0	6 2 5 6	3 6 7 0 4 *
7	5 0 0 0	4 8 4 5	4 9 0 0	5 9 7 9	5 1 4 5	5 1 5 7	3 1 0 2 6 *
8	3 6 5 6	3 0 0 0	3 3 0 0	3 5 0 0	4 1 4 0	4 0 4 7	2 1 6 4 3 *
9	4 0 0 0	4 8 5 6	4 1 4 6	4 1 0 5	5 2 0 0	3 9 0 0	2 6 2 0 7 *
10	2 5 6 0	4 1 3 0	2 9 5 8	2 7 5 6	3 1 4 0	3 1 0 8	1 8 6 5 2 *
11	4 3 5 0	5 0 0 0	4 1 9 9	4 4 5 0	4 4 6 0	4 0 0 9	2 6 4 6 6 *
12	1 5 4 5	2 2 4 0	1 7 4 5	1 6 4 5	1 7 3 5	2 0 0 0	1 0 9 1 0 *
13	2 3 5 0	1 8 5 7	3 1 4 6	3 2 5 0	3 2 4 0	3 0 0 0	1 6 8 4 3 *
14	3 6 5 0	3 2 0 6	2 8 5 7	3 7 4 5	4 0 0 0	4 1 0 8	2 1 5 6 6 *
15	4 2 4 0	4 0 0 0	4 1 0 0	4 0 0 0	4 5 0 0	4 2 6 0	2 5 1 0 0 *
16	2 5 0 0	2 3 0 5	2 7 4 6	2 8 4 6	2 6 4 5	3 7 0 6	1 6 7 4 8 *
17	1 3 3 5 6	1 3 0 5 6	1 4 2 4 5	1 2 5 4 5	1 2 8 5 7	1 5 4 5 7	6 1 5 1 6 *
18	4 2 4 5	4 1 3 4	3 8 5 8	5 1 0 3	4 1 5 7	4 0 0 8	2 5 5 0 5 *
19	7 3 4 5	7 3 5 0	6 3 8 9	7 2 3 0	7 2 3 4	7 5 6 6	4 3 1 1 4 *
20	2 4 5 5	2 2 0 0	2 6 4 6	2 6 3 5	2 4 7 6	3 1 4 0	1 5 5 5 2 *
21	5 3 6 7	4 3 5 6	5 2 5 7	5 2 3 0	5 2 3 3	4 8 8 8	3 0 3 3 1 *
22	7 4 3 4	7 2 3 0	7 1 3 0	7 0 0 0	7 5 0 0	7 7 7 7	4 4 0 7 1 *
23	4 6 0 0	4 2 4 5	3 9 6 8	5 0 0 0	5 1 0 0	5 2 3 3	2 8 1 4 6 *
24	6 5 0 0	6 2 4 5	6 1 0 0	5 2 5 7	6 3 6 7	6 5 5 5	3 7 0 2 4 *
25	1 5 2 3 0	1 4 5 6 0	1 4 5 0 0	1 6 2 4 0	1 6 3 5 6	1 0 5 0 0	8 7 3 8 6 *
26	1 2 3 5 0	1 1 1 5 0	1 5 0 0 5	1 2 0 5 0	1 4 2 6 8	1 5 3 5 0	8 0 1 7 3 *
27	5 3 4 5	4 8 5 6	3 2 0 0	4 9 5 6	4 8 5 7	5 8 8 8	2 9 1 0 2 *
28	4 7 6 6	5 2 4 5	3 1 5 0	4 2 4 5	5 1 0 0	6 1 3 0	2 8 6 3 5 *
29	1 5 4 5	2 2 0 0	1 2 5 0	1 2 4 4	2 2 5 0	2 0 0 0	1 0 4 8 9 *
30	3 2 5 6	3 5 0 0	2 2 6 6	3 1 0 5	4 1 3 0	2 7 0 7	1 8 9 6 4 *
31	5 3 4 5	4 8 4 5	4 2 0 0	4 1 4 0	5 7 5 6	3 7 6 7	2 8 0 5 5 *
32	3 6 5 6	2 1 5 6	4 1 3 5	4 0 0 0	4 1 3 5	4 2 6 6	2 2 3 4 8 *
	1,9 0 4 3 9 *	1,8 4 1 4 4 *	1,8 0 2 5 2 *	1,8 9 3 0 6 *	2,0 3 3 7 6 *	1,9 7 3 4 8 *	1,1 4 4 8 6 5 *

Fig. 32

The machine carriage permits of tabulations similar to the above. This is a miniature reproduction of actual work. Note its neatness and uniformity.



Fig. 33

No. 9 Burroughs

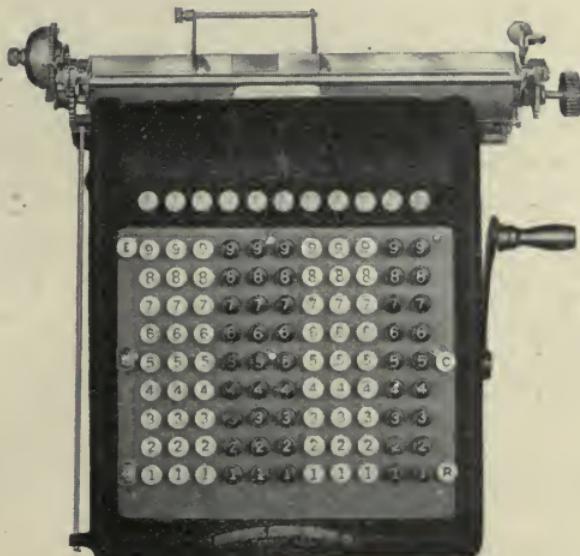


Fig. 34

No. 11 Burroughs

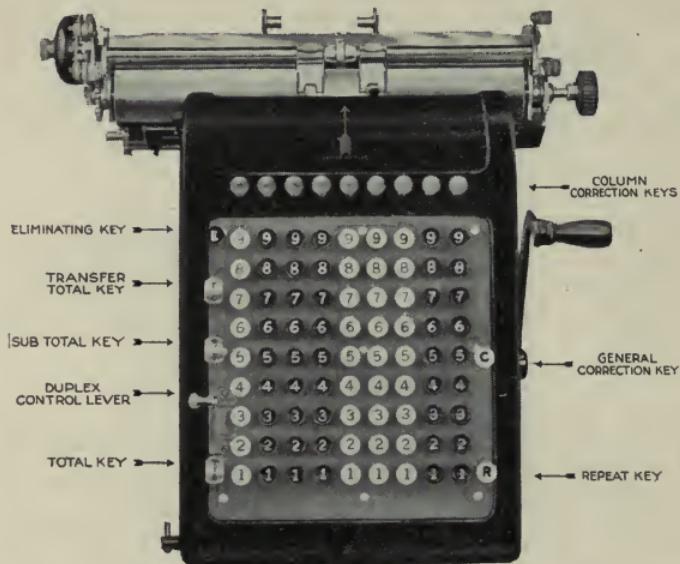


Fig. 35

Keyboard View of the Burroughs Duplex
Adding and Listing Machine.

NAMES	MON.	TUES	WED.	THURS	FRI	SAT	TOTALS.
T. M. Smith	3.00	2.95	3.00	2.75	3.00	2.80	17.50 \dagger
F. G. Thomas	3.25	3.00	3.25	2.85	3.25	2.80	18.40 \dagger
R. Watson	2.95	3.10	3.10	3.00	3.10	3.00	18.25 \dagger
P. F. W. Timm	2.75	3.20	3.00	3.10	3.15	3.00	18.20 \dagger
G. G. Hatch	3.00	3.25	3.00	2.95	2.95	3.10	18.25 \dagger
V. M. Moore	3.00	3.00	3.20	3.00	2.80	2.85	17.85 \dagger
R. D. Sim	3.25	3.00	3.10	3.00	3.00	3.00	18.35 \dagger
					Grand Total.		126.80 \dagger

Fig. 36

Sample of Duplex work showing how the machine is used for preparing a weekly pay roll.

the machine will be thrown out and not be added in with the items that are to be totaled. If there is no amount in the machine the star alone will be printed. The star is a signal to the operator that the machine is "cleared for action" and also a safeguard for the accuracy of his totals.

The illustration in Figure 30 shows the machine carriage, which closely resembles a typewriter carriage. The arrows indicate its principal features and the tabulated sheet in Figure 32, as well as many other sheets of similar nature that are reproduced in this book, show the kind of work that it can do.

The illustrations in Figures 33 and 34 show two styles of Burroughs Machines, namely, the nine-column (No. 9) and the eleven-column (No. 11). These machines are illustrated for the purpose of pointing out two of the styles of Burroughs that are used in Cost Departments.

Another style is the No. 9 Duplex, shown in Figure 35, together with a sample of its work. (Figure 36.)

To all appearances it is the same as the regular machine (the illustration closely resembles a No. 9), but it is constructed with two sets of adding wheels so that the totals of any number of groups of items can be obtained and also the grand total of all the groups at one operation.

In other words, a total pay roll for each department of a plant can be secured and by shifting a lever and pulling the handle again a grand total for all departments can be printed. Or, the total weekly or monthly earnings of each workman and grand total for all workmen can be obtained at one operation.

The fac-simile illustration in Figure 36 shows a sample of Duplex work.

It is impossible to outline every operation in a cost system where an adding machine can be used to advantage, but we can give suggestions and illustrations where it has been applied in our own and other cost departments that will show the versatility of a Burroughs.

The
Burroughs
Machine

The Burroughs Machine While we build a number of different styles, it doesn't signify that each style is cut out for its own little batch of work and no more. The difference in styles consists principally in the difference in sizes ranging from 6 column machines to 17 column machines, and embracing special features that are intended to handle special work.

The machine we ordinarily advocate for a cost department is the Burroughs Duplex Cost Machine of 15 columns with electric drive, $12\frac{1}{4}$ inch carriage and arranged to add amounts of earnings and time (either in hours and $\frac{1}{4}$ fractions or in hours and minutes), at one operation.

The fraction keys constitute the special feature of the cost machine, but this in nowise interferes with its adding and listing ordinary amounts, or its capability for tabulating final results on statement sheets, or whatever report forms are necessary.

Take for instance the machine shown in Figure 27, which is the Duplex cost machine.

	1 8 $\frac{1}{4}$
	—*
3 7 $\frac{1}{4}$	1 2.6 5
4 4 $\frac{1}{2}$	1 4.4 5
5 4	1 8.6 5
3 5 $\frac{3}{4}$	1 1.4 4
5 4	1 8.0 0
5 7	2 1.3 5
4 4 $\frac{1}{2}$	1 5.6 0
3 2 7	1 1 2 1 4 —*

Fig. 37

When it is desired to add workmen's time and amount of earnings, from the labor tickets, by workmen, accounts, departments or other classifications, the operator first

prints the reference number, using the eliminating key The Burroughs Machine to prevent it from adding. He sets the time in the left hand section and the amount in the right hand section. Then by touching the electric contact bar both items are printed on the paper and added. The second pair of items is taken off in the same way, and so on until all items for the classification have been added and listed. Then by depressing the total button and touching the contact bar, the two totals are printed as shown in the illustration. Note the department number, the listed items and the totals in Figure 37.

Job 633#	*
	*
3.35	
4.55	
12.05	
2.36	
4.00	
2.55	
3.25	
1.45	
33.56	*

Fig. 38

done very quickly on the machine, getting an absolute proof of the work. The right hand section is used for these operations and the calculations come from the machine as shown in Figure 40. By pointing off the result the proper number of places, the amount in dollars and cents is obtained. The decimal points in this case are represented by the vertical lines which are put in by hand.

One of the greatest advantages of a listing machine for such work as this lies in the fact that every step of the calculation is printed on the paper. When the operation has been completed the work can be quickly proved, first by inspecting the amounts listed (these representing the

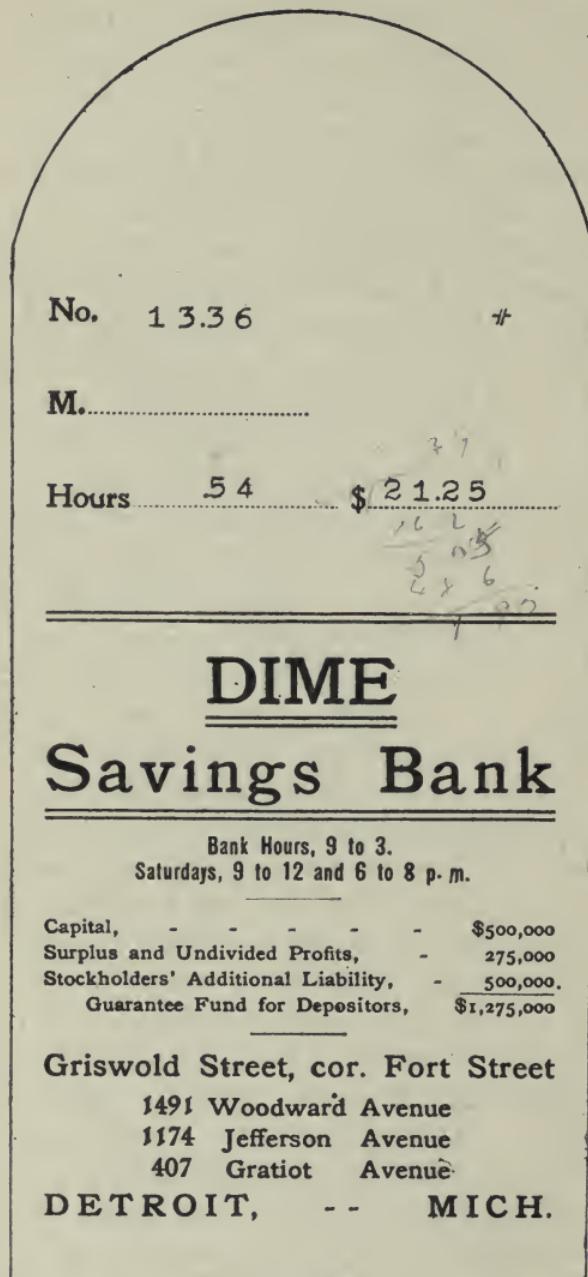


Fig. 39

Pay envelope showing a workman's Number, Time and Earnings recorded with the Burroughs Adding Machine.

*	*
3 4 . 2 5	1 4 . 9 5
3 4 . 2 5	1 4 . 9 5
3 4 . 2 5	1 4 9 . 5 0
3 4 . 2 5	1 , 4 9 5 . 0 0
3 4 2 . 5 0	1 , 4 9 5 . 0 0
3 , 4 2 5 . 0 0	1 , 4 9 5 . 0 0
3 , 4 2 5 . 0 0	1 , 4 9 5 . 0 0
7 , 3 | 2 9 . 5 0 *	6 , 1 | 5 9 . 4 0 *

The
Burroughs
Machine

Fig. 40

multiplicands), and then counting the number of times the amounts have been repeated, thus checking the multipliers.

A very little practice soon makes a machine operator quite expert in multiplying, and when once he has mastered the operation he will never give it up.

If it is desired to enter the amounts of pay on the envelopes, the machine can do it quickly. See Figure 39.

The operator places the envelope in the carriage and turns it up to a certain point, which his eye soon becomes accustomed to, thus enabling him to do it very rapidly. Then he sets the workman's number in the left hand section (ignoring the fraction column altogether) depresses the eliminating button and pulls the handle. Then he sets the time in the left hand section and the amount in the right hand section. A touch of the bar lists both items and adds only the amount.

The envelope is turned out and another inserted, the number, time and amount being set down on it in the same manner. When all the amounts have been set down, the total that shows on the adding wheels should agree with the pay roll total. If it does, the pay roll clerk knows that the correct amounts have been printed on the envelopes and that there is no necessity for checking

The
Envelope

10				No. 16.			PAY ROLL		
10				No. 16.			PAY ROLL		
NO.	NAME	DEPT.	WEEK ENDING	NO.	NAME	DEPT.	WEEK ENDING	EX-DET #1	
00	Chas. Robertson			00					
01	John Jones			01	62	1736			
02	Chas. Smith			01	534	1338			
03	J. W. Hendrick			02	464	1169			
04	G. L. Tracy			03	584	1755			
05	F. T. Johnson			04	524	1306			
06	H. B. Bender			05	444	1169			
07	C. L. Simons			06	494	1238			
08	M. T. Mueller			07	54	1350			
09	D. B. Anderson			08	484	1365			
10	G. S. Kosi			09	54	1512			
11	W. W. McNaughlin			10	54	1620			
12				11	59	1770			
13	G. F. Keller			12					
14	F. H. Snell			13					
15	F. F. Peterson			14					
16	E. D. Adams			15					
17	D. D. Higgins			16					
18	H. A. Albrecht			17					
19	I. G. Gilbert			18					
20	J. F. Gibbe			19					
21	J. G. Marx			20					
22	H. F. Holland			21					
23	T. P. Krein			22					
24	C. S. Hess			23					
25	H. E. Joyce			24					
26	H. W. Knapp			25					
27	H. W. Longly			26					
28	W. W. Morris			27					
29	T. P. Parker			28					
30	P. D. Peacock			29					
31				30					
32	Chas. Rogers			31					
33	C. C. Kenney			32					
34	B. T. Waller			33					
35	D. E. Warden			34					
36	E. V. Wright			35					
37	J. J. Coudy			36					
38	G. F. Russell			37					
39	B. J. Reaves			38					
40	L. L. Loeing			39					
41	K. E. Lione			40					
42	B. O. Kimball			41					
43	H. H. Neilson			42					
44	F. P. Thaich			43					
45	H. J. Grimes			44					
46	D. B. Grimes			45					
47	F. B. Fuller			46					
48	B. J. Simonds			47					
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				253					
				254					

them back to be sure about it. If the total by departments is desired, each total can be noted as soon as the last envelope for each department has gone through the machine. In cases like this, the Duplex Machine enables the operator to secure the total for each department and a grand total for all departments without recapitulating the department totals.

We made a test of this method with a number of envelopes, and found that the amounts could be written by machine and the total checked much more quickly than it was possible by hand. The illustration, Figure 39, shows an envelope prepared by the Cost Machine.

Then the pay roll clerk may want to prepare a pay roll sheet recording workmen's hours and amounts.

He inserts the pay roll sheet in the $12\frac{1}{4}$ -inch carriage, which will accommodate sheets up to that width and runs off the time and amounts, adding the amounts only. All that is necessary is to set the number in the left hand section and the amount in the right hand section and touch the bar. The machine does the rest as shown in the illustration. See Figure 41.

5 4 $\frac{1}{4}$	1 2.36	*
4 5 $\frac{1}{2}$	1 5.00	
3 9	1 3.00	±
4 0 $\frac{3}{4}$	1 7.55	±
5 4	1 8.00	
4 1 $\frac{1}{4}$	1 9.45	±
1 7 $\frac{1}{2}$	1 1.40	±
1 3 8 $\frac{1}{2}$	6 1.40	±
1 5 3 $\frac{3}{4}$	4 5.36	±
2 9 2 $\frac{1}{4}$	1 0 6.76	*

Fig. 42

The Burroughs Machine

Hours and amounts of both day and piece workers can be added and listed at the same time with the Duplex Machine, securing totals for each and a grand total of both. The illustration, Figure 42, shows how this work is done. The items opposite the symbol (±) are for piece workers and are

The added in the lower counter, while the other items are for Burroughs day workers and are added in the upper counter. The Machine first total opposite the “s” is for piece workers, the next total opposite “t” is for day workers and the last total opposite “*” is the combined total of day and piece workers.

When the cost keeper wishes to prepare his summary or report sheets he places them in the machine and runs off column after column of figures, just the same as he would do on a typewriter, with the added advantage that he can print a total of each column as soon as the last item has been listed. See Figure 32.

A Few Only These are a few of the many things that *one* Burroughs Cost Machine will do, and we call your attention to them in order to impress upon you the fact that it is an all round assistant in the Cost Department and not a machine whose special features limit its capacity for work or one that is to be used for “adding” only.

Where a cost department is large and can use several machines more economically than one, we usually advocate that some of them be cost machines and some regulars. Under these conditions one, two, three or more clerks are often delegated to the task of getting total time and earnings of workmen, and need the cost machine for this special class of work, while others are employed in straight adding and listing of material requisitions, or in making extensions, which can be done on regular machines.

However, when only one machine is to be used in a department and time and earnings are to be added and listed, pay rolls prepared, extensions made, etc., the Duplex Cost Machine should be installed by all means, because it is far better adapted to all the different classes of work that will be required of it.

CHAPTER XIX

Cost System in the Burroughs Factory

THE Cost System in the Burroughs Factory will be made clearer by first giving a general idea of the route raw material takes, and describing the two distinct processes necessary to complete an adding machine.

The first process consists of converting the raw material into finished parts which are ordered in lots ranging from several hundred to several thousand, according to the quantity we have found advisable to keep on hand.

These parts, after having been inspected, are turned into the Finished Stock Room.

The next process is the assembling of the parts into the complete machine. Our cost records take into consideration both of these processes, the two being handled along very similar lines.

The diagram in Figure 43 gives a good idea of the route that raw stock takes through our factory, from the time it is received in the Raw Stock Room until the completed machine is received in the Shipping Room.

All orders for new machines or parts originate in the Superintendent's office.

When the finished stock keeper discovers that a certain part has reached the low water mark, the Superintendent's office is notified and the Production Order for new parts is issued, the order being sent to the foreman of the department that is to perform the first operation upon it. A cost record card is sent to the cost keeper notifying him that the job has been started.

A requisition is also forwarded from the Superintendent's office to the raw stockkeeper, notifying him that a certain amount of stock will be withdrawn by the foreman

Cost System for that job. When the foreman receives the material, one or more of his men perform the first operation upon it, and he sends in their time tickets to the Cost Department and passes the partly finished product on to the next department, after it has been O. K'd.

Each department that performs an operation on it sends its time tickets to the Cost Department. As soon as the last operating department has finished the job, the parts are sent to the Finished Stock Room and the Cost Department is notified that the job has been finished.

The Cost Department can then recapitulate the labor cost of the job, the material cost and figure the burden, getting the total cost of the job.

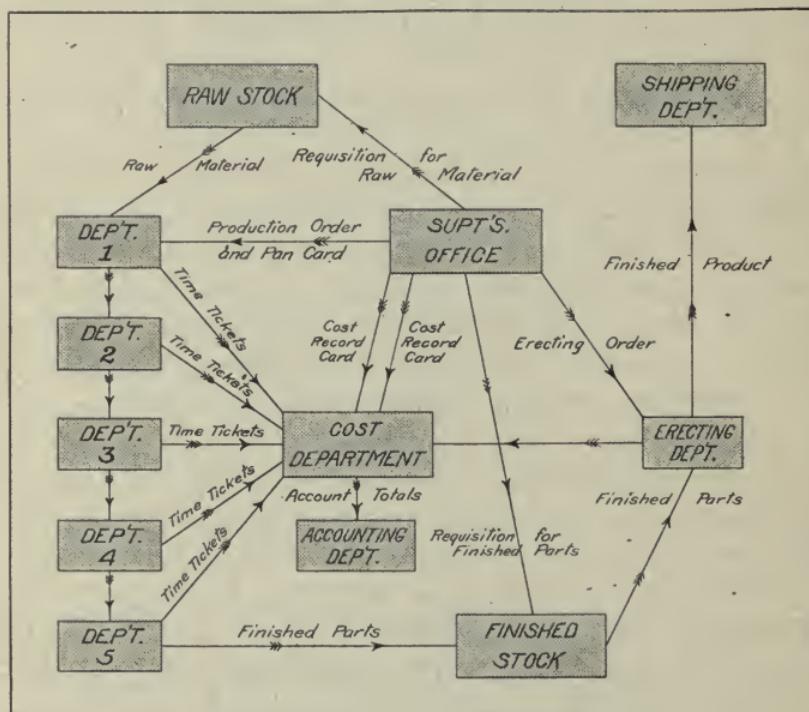


Fig. 43

Diagram showing route of material from raw stock room to shipping room.

When it is desired to erect a number of machines of A certain style, the Superintendent's Office issues an order to the Erecting Department and sends a requisition to the Finished Stock Department calling for a certain number of finished parts, which are sent by the Finished Stock Department to the Erecting Department. A copy of the factory order is sent to the Cost Department, notifying it that certain machines are to be erected.

The time tickets of the Erecting Department are sent to the Cost Department, where the total labor cost and burden for assembling the parts into machines, are calculated.

Then the finished machines are sent to the Shipping Department, where they are ready for the customer. A Bird's-eye View

The above outline gives a good bird's-eye view of our factory operation and makes the following description of the system more easily understood.

What we accomplish with our cost system can be summed up under eight general heads. We find out:

- 1—The labor cost of each job.
- 2—The labor cost of assembling the parts into machines.
- 3—The labor cost of each workman.
- 4—The labor cost of each operation.
- 5—The cost of material for each job.
- 6—The total amount of labor cost, burden and material to be charged to the various manufacturing accounts.
- 7—The total cost of the complete machine.
- 8—The relative efficiency of day and piece workers on the same job.

Our system has been planned so that it not only gives the cost of machines, but furnishes a means of keeping every workman under close observation and recording his work in such way that his value can be obtained upon very short notice.

By studying the diagram in Figure 43, it will be seen that a great number of time tickets pour into the cost department every day. This is due to the fact that a

C O S T K E E P I N G S H O R T C U T S

Fig. 44

A Box Card accompanies the material through the various factory operations

separate ticket is made out for each operation. The A Cost adding machine makes it possible to recapitulate these System with a minimum expenditure of time and labor.

It would be useless to attempt a minute description of How it Operates a cost system in the few pages at our disposal, so in outlining the Burroughs System, only its principal features will be discussed.

In our business the product in process of manufacture can be handled most conveniently in metal boxes. Each batch of raw material or work in process is carried from department to department in galvanized iron boxes. Each box is numbered in plain white figures.

When a job is started, a box card (Figure 44) is made out in duplicate in the Superintendent's office, the original going with the box of material to the Department that is to first work upon it, and thence on through the different operations in other departments until it is finished. It is then turned over to the cost keeper as a notification that the job has been completed. The duplicate copy remains in the Superintendent's office as a tracer.

On each box card is recorded the box number, number of boxes required for the batch of material, symbol or part number, quantity of material used, number of parts wanted, number of parts to the box, date due, etc. In the left hand column of the card are recorded the various operations through which the part is to pass and the numbers of the departments that will perform these operations. Figure 44 is a reduced facsimile of a box card made out for a certain shaft in the machine.

As soon as the foreman receives the box card and the material, he goes ahead with the operation, completes it and fills in the blank spaces opposite his department number, indicating the number of parts he makes, number spoiled, date the job is passed on, etc.

Then he sends a notification ticket in duplicate to the Superintendent's office. The number of parts that

C O S T K E E P I N G S H O R T C U T S

S. A. M. CO. FCTRY. FORM 380 BOX NO. 2672		ORDER FOR STOCK SYMBOL 600 A--9		LOT NO. 5
DATE OF ORDER <u>2-7-'10</u>				
NAME OF PART <u>Shaft supporting 611's</u>				
STOREKEEPER:— PLEASE DELIVER TO <u>4</u> THE THE FOLLOWING MATERIAL.				
QUANTITY	DESCRIPTION OF MATERIAL OR PARTS USED			
4020	507 Gun Rod			
NUMBER PARTS WANTED 5000	NUMBER PER BOX 200	STOCK ORDER DEPARTMENT J.C.H.		
PER				
DATE DUE 4-15-'10	NUMBER OF BOXES 25	DELIVERED BY.		

Fig. 45
Stock Order Card, made at same time with box card

S. A. M. CO. FCTRY. FORM 381 BOX NO. 2672		COST RECORD SYMBOL 600 A--9		LOT NO. 5
DATE OF ORDER <u>2-7-'10</u>				
NAME OF PART <u>Shaft supporting 611's</u>				
STARTED IN <u>4</u>	DEPARTMENT			
QUANTITY	DESCRIPTION OF MATERIAL OR PARTS USED			AMOUNT
4020	507 Gun Rod			
NUMBER PARTS WANTED 5000	NUMBER PER BOX 200	NUMBER PARTS TRANS'F'D J.C.H.	NO. PARTS FINISHED	
DATE DUE 4-15-'10	NUMBER OF BOXES 25	NUMBER PARTS DESTROYED	DATE REC'D FIN. STOCK	

Fig. 46
Cost Record Card, made in skeleton at same time with box card

have been made, the number rejected, the workman's A number, etc., are taken from this ticket and entered on the Superintendent's tracer, which is the duplicate of the box card.

The Superintendent's clerk then refers the duplicate ticket to the foreman of the next department, informing him that he is the next man to handle the material.

When the foreman of this department is ready to handle the material, he sends the truckman, with the ticket, to the first department which delivers the material to him.

As soon as Department 2 completes its operation, another notification ticket is made out and the material is passed on to the next department.

By this system the Superintendent's office is notified of the completion of each operation, and knows at all times where each partly finished job is located in the factory and how near it is to completion.

In addition to the box card and tracer there is a third copy, made out at the same time. It contains only the information that is on the upper half of the card and serves as an order to the Raw Stockkeeper. This stock order is shown in Figure 45 and gives the stockkeeper authority to issue stock as it is requisitioned by the foreman of the department that is to perform the first operation upon it.

It is, of course, necessary for the foreman to send in a separate requisition for each lot of material that he uses.

For instance, the stock order may call for 150 pounds of a certain kind of stock and the foreman may send in requisitions for only 25 pounds at a time, according to the amount that he finds convenient to handle at one operation.

On the reverse side of this card are columns for date, description, quantity, price and amount. In these columns are recorded the amounts of raw stock issued on each requisition of the foreman.

A Cost System When the last amount has been withdrawn, the total of the items on the reverse side should equal the amount on the face of the stock order.

If it happens that the Superintendent's clerk over-estimates the amount of stock necessary to make the parts, a credit ticket is made out and the over amount is deducted from the amount indicated on the face of the order. This over amount is then credited back to the stock record card. If the original quantity is insufficient, another requisition is made and the extra amount is added to the original amount indicated on the stock order and debited on the stock record card.

There is also a fourth copy which contains the same information as the stock order and serves as a Cost Record Card, Figure 46. This card is sent to the Cost Department, where it is filed in a cabinet; it notifies the cost keeper that a new job has been started in the factory. All the time tickets referring to this job are filed behind the cost record card, as are also the requisitions for the material that goes into the job. Upon the completion of the job, the time tickets and requisitions are sorted by departments and recapitulated with the adding machine, thus securing the labor and material costs. The burden for each department is then figured and posted in its column on the back of the card. Then by combining the labor, material and burden totals the cost to manufacture that particular part is secured.

Figure 46 shows a cost record card and Figure 47 shows the reverse side where the total labor, burden and material costs are recorded.

The four forms, namely, Box Card, Tracer, Stock Order and Cost Card are used both for the manufacture of parts and also for the assembling of parts into what we call dash symbols, which are machine sections composed of two or more parts joined together.

When a certain style of Burroughs Adding Machine is to be erected, a factory order is made out in triplicate, giving specifications for that particular style of machine. One of the copies goes to the Cost Department, where it is placed on file, and notifies the cost keeper that a certain style of machine is to be erected.

Then as the time tickets, Figure 48, of the men at the erecting benches come in they are filed behind the factory order, together with the requisitions for parts and sections that go into the machine.

As soon as the machines are completed the cost keeper is notified. Upon receiving the notification he adds up the labor tickets and the material requisitions and figures the burden. Then on the back of his copy of the factory order he records the labor cost, material cost and burden in total and by the various departments that have worked on the erection of the machines.

Figures 49 and 50 show the face and reverse of our factory order.

The data is then transferred to a permanent card record on which is recorded the cost per machine for that particular style and is used for comparative purposes when other machines of the same style are erected. This is a very valuable record, not only because it gives the cost to manufacture the machine (which is the first object of the cost system), but because the cost to make machines of the same style can be compared from time to time, giving a check and enabling an average cost to be struck, from which no very great variation should occur.

The greatest factor in making it possible to secure proper data is the use of the individual time ticket for every job. While these pour into the Cost Department in large numbers they are quickly disposed of by using the adding machine, which recapitulates them by departments, by jobs, etc., in the shortest possible time.

LABOR & BURDEN COST					SYMBOL & LOT NO		
DATE	DEPT	HOURS	LABOR	BURDEN	SUMMARY		
					DETAILS	ITEM	TOTAL
					LABOR		
					BURDEN		
					LESS ITEMS TRANSF'D F. O.		
					F. O.		
					F. O.		
					F. O.		
					F. O.		
					MATERIAL		
					UNIT COST		

Fig. 47

Reverse side of Cost Record Card, showing spaces for detailed items of cost

TIME TICKET		DEPARTMENT NO. 18		
WORKMAN'S NAME	Geo. Russell	DATE	WORKMAN'S NO. 1875	
ORDER NO.	214	BOX NO.	NO. PIECES	ACCOUNT NO.
4	7521	750	31	
OPERATION	TIME	RATE		AMOUNT
22-B	5 1/2	HOURLY	HUNDRED	DOLLARS CENTS
		.22		1 65
REMARKS				
TIME STARTED		TIME FINISHED		
6:30		1:00		
FOREMAN'S O. K.				
Marsh		BURROUGHS ADDING MACHINE CO. FACTORY FORM NO. 878		
B. & B. CO. 533156				

Fig. 48

Each workman turns in a time ticket on completion of each job or operation

Burroughs Adding Machine Company		FACTORY ORDER.	
		F. O. NO.	
ORDER DATED.....	ORDER NO.	A. O. NO.	MACHINE NOS.
SHIP TO	VIA	SHIPPED	
CHARGE ACCOUNT OF		WANTED	PROMISED
STYLE	CONS'T	QUANTITY	SPECIFICATIONS
COST RECORD			

Fig. 49

Burroughs Factory Order on which are written the specifications for machines to be built

Fig. 50
Reverse side of Burroughs Factory Order with spaces for the cost details

In our factory a separate time ticket is made out for A each operation, one man turning in from one to a dozen Cost tickets a day, according to the nature of his work. System

The foreman's clerk makes out a ticket for each workman when he begins a job and checks the time on the tickets at the completion of the job. The various jobs, operations, departments, etc., are identified by numbers on the time ticket.

We use two different kinds of time tickets, one for day workers and one for piece workers. The day workers' ticket is shown in Figure 48. The piece workers' ticket is similar, but is yellow instead of white and is made out in duplicate, the original having a carbonized back to save using carbon paper. These tickets are arranged in pads, every other one being carbonized, with a duplicate between each so that no extra time is required in filling them out. The reason for using duplicate tickets for piece workers is that it facilitates the checking of the pay roll. The single ticket serves for day workers as will be shown in the description of checking the pay roll which follows:

Every morning the time tickets for the previous day are sent to the time keeper, who sorts them by departments and then by workmen. The first thing done is the checking of the extensions on the piece workers' tickets. The day workers' tickets are checked by another process which is described in detail later on.

After the piece work ticket extensions have been checked, both they and the day work tickets are added and listed at separate operations on the Duplex Machine, which secures the day's total of hours worked and amount earned by each workman and at the same time automatically recapitulates these totals, giving the total hours and amounts for all the day workers and all the piece workers in the department.

A Cost System Since there are $9\frac{3}{4}$ working hours in a day, the total time of each workman, as shown on the adding machine slip, should be $9\frac{3}{4}$ hours. In case it is not $9\frac{3}{4}$ hours the time keeper knows that either the ticket was made out wrong or that the workman did not put in the whole day. Any undertime is immediately checked by comparing it with the workman's clock card, on which is registered his time of entry into the factory.

DAILY PROOF REPORT			DEPT NO. <u>18</u>	DATE <u>1-25-'10</u>	
ACCOUNT NUMBER	HOURS	AMOUNT		HOURS	AMOUNT
3	29 $\frac{1}{4}$	4 20	PRECEDING DAY'S ALLOTMENT	1032 $\frac{1}{4}$	303 09
10	32 $\frac{1}{4}$	9 34	ADD: NEW EMPLOYEES	9 $\frac{3}{4}$	1 95
14	12 $\frac{1}{2}$	5 23	CHANGES OF RATES		
15	425 $\frac{1}{4}$	125 01	TOTAL	1042	305 04
16	300 $\frac{1}{2}$	92 05	DEDUCT: EMPLOYEES QUIT	19 $\frac{1}{2}$	4 00
17	197 $\frac{1}{2}$	53 92			
43	29 $\frac{1}{4}$	11 70	PRESENT ALLOTMENT	1022 $\frac{1}{2}$	301 04
			ADD: OVERTIME AND ALLOWANCES	10 $\frac{1}{2}$	2 36
			PIECE WORK		
			TOTAL	1033	303 40
			DEDUCT: LATES & ABSENTEES	6 $\frac{1}{2}$	1 95
TOTALS	1026 $\frac{1}{2}$	301 45	PAY ROLL	1026 $\frac{1}{2}$	301 45

1075-3M 12-16-B Cont. P.A.S.

Fig. 51
Daily Proof Report.

This, however, does not show why the workman did not work all day and for this purpose we use a "Daily Proof Report" and a Time Keeper's Daily Report, as shown in Figures 51 and 52.

It is obvious that if all the day workers in a department, whose daily earnings for full time are known to the cent, are present, that the total amount of time they will put in and the amount of money they will earn can be known. These items of time and earnings, based on the assumption that all the men work the full day, are shown in Figure 51, opposite "Preceding Day's Allotment."

TIME-KEEPER'S DAILY REPORT.

DEPARTMENT No. 18

DATE 1-25-10

LIST AND CLASSIFY UNDER PROPER HEADING ABSENT, LATE, PASS OUT QUIT, STARTED, OVERTIME & ALLOWANCE, AND CHANGES OF RATE.

NO.	NAME	HR'S	AM'T	NO.	NAME	HR'S	AM'T
<i>New Employees</i>							
182	Jones	9 $\frac{3}{4}$	1 95				
<i>Employees Quit</i>							
186	Ortiz	9 $\frac{3}{4}$	2 00				
184	Rucker	9 $\frac{3}{4}$	2 00				
<i>Overtime and Allowance</i>							
181	Simpson	5	1 00				
189	Rodgers	3 $\frac{1}{2}$	90				
190	Wilts	2	46				
<i>Absent</i>							
162	Wilson	6 $\frac{1}{2}$	1 95				

TIME-KEEPER

B. B.

FOREMAN

murphy.

208835.

Burroughs Adding Machine Co. Factory Form No. 277.

Fig. 52

Time Keeper's Daily Report

A Cost System Now in case any of the day workers are late, or absent, or quit, or new employes come in, these facts are noted on the time keepers Daily Report for each department. These reports are made out by the time keeper from the clock cards and from "discharge" and "new employes" slips, which are sent in each day by the foremen. They are then O. K'd by the foremen of the various departments. See Figure 52. This report refers both to day workers and piece workers and gives the reasons for any undertime that may appear on the adding machine slip previously described. Only the lates, absentees, quits, etc., for day workers are transferred to the Daily Proof Report. On the report in Figure 52 is shown a new employe at \$1.95 per day, who is added to the allotment. Next come two employes who have quit, which takes away $19\frac{1}{2}$ hours and \$4.00 in earnings. The next item shows 10 hours and \$2.36 to be added for overtime and the last item shows $6\frac{1}{2}$ hours and \$1.95 to be deducted for lates. Compare the items in Figures 51 and 52. After making these additions and deductions, the remaining $1026\frac{1}{2}$ hours and \$301.45 is allotted for the current day and should agree with the grand total for day workers on the adding machine strip.

If the department is one having both day and piece workers, the total hours and amounts for piece workers are entered on the Proof Report in a space allotted for that purpose and included in the current day's allotment of hours and amounts.

This system not only checks the day workers' tickets, but catches errors in filling out these tickets and prevents any being lost. It also checks the pay roll for day workers.

The piece workers' pay roll cannot be checked until the end of each week, when the pay roll is made up. The time put in by piece workers, however, is checked against

BURROUGHS ADDING MACHINE CO.

DETROIT, MICH.

181

TO THE TIMEKEEPER:

**MY PAY FOR THE WEEK ENDING
SHOULD BE AS FOLLOWS:—**

3/11

191 /

DAY WORK \$4.10
PIECE WORK 16.25
TOTAL 20.35

NUMBER 147 NAME

B. A. M. Co. Form 257 25m-3-29-10 G. M. & T. Co 11757

John Welch

Fig. 53. Employe's Claim Ticket

Fig. 54. Piece Work Card

Burroughs Adding Machine Co.
DEC 15 1910

Week Ending _____

No.	850	Name _____		
Rate	22	Total Hours	54	Amount
(PIECE WORK AMOUNTS SHOWN IN RED)				
Additions				
Total				
Deductions				
Net Amount Due				

DAY	IN	OUT	IN	OUT	IN	OUT	DAILY TOTALS
FRI	6:27		12:28				
SAT	6:30		12:30				
SUN							
MON	6:25		12:25				
TUES	6:30		12:29				
WED	6:29		12:18				
THUR	6:27		12:20				

Received Payment

Bolocke

Fig. 55
Clock Card

the clock cards daily and any undertime or overtime is accounted for on the time keeper's Daily Report.

A
Cost
System

After the checking has been completed, which by the way is accomplished in very short time, the day workers' tickets, the duplicates of the piece workers' tickets and the Daily Proof Report are sent to the Cost Keeping Department, where they are used in figuring the cost of the various jobs and in making the labor distribution to accounts.

The time keeper then files, by workmen's numbers, the original copies of the piece workers' tickets in an ordinary cabinet file behind guide cards, which bear the numbers of the workmen. They remain here until the end of the week when the pay roll is made up. Then they are taken out and added on the machine, getting the total time and earnings for each man. The total time for each man is then checked against the time shown on his clock card and the total earnings are checked against his claim ticket, which is turned in previous to making up the pay roll, and shows what he has calculated to be his earnings for the week. See Figure 53.

In case there is a discrepancy of more than five cents between the time keeper's total and the workman's calculation, the time keeper refers the matter to the foreman for adjustment. After the weekly totals for the piece workers have been checked, the amount is entered on the clock cards from which the pay roll is prepared. The total earnings for day workers are entered on the day workers' clock cards by extending the total number of hours worked and the rate per hour.

There is a cabinet containing rate cards, similar to that in Figure 54, on which is written the rate per hundred or per piece for every part manufactured. These are referred to from time to time for checking the rates entered on the piece workers' tickets, it having been found unnecessary to check all the tickets daily in this way.

A Cost System The Burroughs Pay Roll Sheets are tabulated on a Duplex Cost Machine, which has two complete sets of adding wheels or counters, enabling the operator to record the hours and amounts of earnings for both day workers and piece workers and at the same time to accumulate the total hours and amounts for day workers and piece workers, together with a grand total for both. This is all done at one operation, the work appearing as shown in the columns on the left hand side of the pay roll sheet in Figure 56.

In order that this work may be done in one operation, the keyboard of the Duplex Cost Machine is split into three sections, one of which records the rates of day workers, another adds hours and fractions of hours and the other the amounts earned. This is done by setting up in the hour section the number of hours put in by a workman and in the amount section the wages earned and pulling the handle, both items printing and accumulating. In case a rate is used it can also be printed at the same time the hours and amounts are printed and added.

The two counters comprising the Duplex mechanism are controlled by a little lever located at the left hand side of the keyboard. By means of this equipment the machine can add and list the hours and earnings of both day and piece workers and secure the total hours and earnings for both in one operation. When the machine is to be used for ordinary adding and listing, the upper counter is thrown into operation by shifting the Duplex control lever into the upper position. When necessary to use both upper and lower counters, as when the earnings for day and piece workers are added and listed at one operation, the upper counter items are entered with the control lever in the upper position and the lower counter items are entered with the control lever in the lower position. The lower counter items are distinguished from the former by the little dot and bar, shown in the illustration.

Furthermore, it is possible to accumulate items in the upper counter and to print the total of these items and at the same time clear the upper counter for another addition and transfer the total into the lower counter. This is accomplished by setting the Duplex control lever in the upper position and using the transfer total button instead of the regular total button. When the machine is working this way the lower counter acts as a kind of reservoir for the totals accumulated in the upper counter and thus automatically recapitulates a grand total for any number of totals that may be printed with the upper counter. The grand total may be printed at any time by shifting the Duplex control lever to the lower position and then depressing the regular total button and pulling the handle. The working of this machine as applied to pay rolls will be more clearly understood by following the method described in preparing the Burroughs Pay Roll.

The first thing the operator does is to clear both upper and lower counters. This is done first by shifting the Duplex control lever into the lower position, pressing the total button and pulling the handle and then repeating the operation with the control lever in the upper position. This gives assurance that both counters are cleared for action.

All piece workers' time and earnings are then added in the upper counter and all day workers' rates, time and earnings are added in the lower counter, the items being taken directly from the clock cards. (Figure 55.)

Upon listing the last item, the control lever is shifted to the lower position and a sub-total taken. This operation prints the total day workers' hours and earnings. Then the control lever is moved to the upper position and a transfer total is printed which prints the piece workers' total hours and amounts. Since the printing of the sub-total does not clear it from the lower counter and since the total in the upper counter has been transferred to the

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Cost
System

C O S T K E E P I N G S H O R T C U T S

BURROUGHS ADDING MACHINE COMPANY

SHEET NO. 13

DEPT. 83

PAY ROLL FOR WEEK ENDING

1 19

19.11.13

PRICE AND DAY WORK.			ADDITIONS.		DEDUCTIONS		REMARKS	EMPLOYEE'S NUMBER	NET AMT DUE
Rate	Hours	Amount	Hours	Amount	Hours	Amount			
	5.4	18.58						800	18.58
32	7.5	24.00						801	24.00
22	5.3%	11.83						802	11.83
	5.4	15.70						803	15.70
	3 4 ½	11.93						805	11.88
	4 9 ¼	17.58						806	17.58
	3.9	13.35						807	13.35
20	5.4	10.80						808	10.80
22	4.4	10.51						809	10.5
	5.4	19.08						810	19.08
	5.4	17.87						811	17.72
	4 8 ¼	15.78						812	15.78
	5 5 ¼	18.37						813	18.37
24	5.4	12.96						814	12.96
26	5.4	14.04						815	14.04
	5.4	17.21						816	17.21
	4 4 ½	15.82						817	15.82
	3.9	13.54						818	13.54
24	5.4	12.96						819	12.96
	5.4	19.37						820	19.37
	5 3 ¼	18.69						821	18.69
	5.4	17.19						822	17.19
28	5.4	15.12						823	15.12
40	5.4	21.60						824	21.60
	5.4	18.75						825	18.75
	5.4	16.89						826	16.89
33	5.4	17.82						827	17.82
	5.4	15.21						828	15.21
20	5.4	16.20						829	16.20
24	5.4	12.96						830	12.96
29	5.4	15.66						831	15.66
	5.4	16.98						832	16.98
	5.4	17.36						833	17.36
	6 7 ¾	187.0.08							5220.58
	100 9 ¼	335.25							
	1683	522.25							

Fig. 56

lower counter, it is obvious that the lower counter now contains an amount equal to the sum of both. By shifting the control lever into the lower position again and taking a total in the usual way the grand totals of day and piece workers' "1683" hours and "522.25" are printed.

The cards are then turned through again and the workmen's numbers and net amounts entered at one operation, only the amounts totaling. This work is done on the upper counter, the operation being identical with that of a regular machine. — Next the additions and deductions are added and listed and the sheet is proved by checking the grand total of earnings plus additions against the total net amounts, plus the deductions.

After the items have been run on the pay roll sheet, the clock cards are re-distributed to the card racks where each workman secures his card and signs it. He then presents his card as a receipt at the pay master's window and receives his pay. The cards are afterwards filed and kept for a limited time and the pay roll sheets are placed in a loose leaf binder, serving as a record of the amount of money paid to the employees in the different departments.

No names are recorded on the pay roll sheet. This has been found unnecessary, because the clock card is the original source of entry and also serves as a receipt from the workman. In case any dispute should arise the clock card is consulted rather than the pay roll sheet.

By doing away with writing the names we have greatly simplified our pay roll and made it possible to prepare it in much less time. The efficiency of the system can be judged by the fact that it takes care of some 1400 men weekly and has been in successful operation for more than a year.

We also prepare a pay roll summary each week, showing only the total amount of money paid out for labor in the different departments. This summary is made up with the adding machine as shown in Figure 57.

A
Cost
System

SUMMARY OF PAY ROLL						
FOR WEEK ENDING 12-11, 1909						
DEPT NO.	SHEET NO.	DAY WORK	PIECE WORK	TOTAL	DEDUCTIONS	NET AMOUNT DUE
1		72150	22545	94695	650	94045
2		64560		64560		64560
3		83305		83305		83305
4		57550	42450	100000	2500	97500
5		20805	44796	65601	336	65265
6		120000		120000		120000
7		63345		63345		63345
8			73450	73450		73450
9		152305		152305	505	151800
10		35550		35550		35550
11		64466		64466		64466
12		46770		46770	200	46570
13			52350	52350		52350
14		35670	16455	52125		52125
15			152350	152350	350	152000
16		210455		210455		210455
17		23566		23566		23566
18		34456		34456	700	33756
19			42555	42555		42555
20		14676	22525	37201		37201
21		25345	8465	33810	500	33310
22		16455	9744	26199		26199
23		6455		6455		6455
24			52350	52350		52350
25		15566	73650	89216	1.15	89101
26			16645	16645	500	16145
27		22350	89455	111805		111805
28		16345	132555	148900		148900
29		8845		8845	100	8745
30			120000	120000		120000
31			152500	152500	362	152138
32		15345	50000	65345		65345
		12,26335*	11,74840*	24,011.75*	6818*	23,943.57*

Fig. 57

Summary of Pay Roll made on a Burroughs Adding Machine

The first thing done upon receipt of the workmen's time tickets in the Cost Department is to sort them by departments and accounts and get the total number of hours and the amounts for each account in each department by adding the tickets on the adding machine.

These totals are posted in the columns on the left hand side of the proof reports for the various departments and the grand total of the totals for the various amounts on each card must agree with the current day's allotment, as shown by the total hours and amounts which have been entered by the time keeper on the right hand side of the card. In this way the daily distribution of labor, by accounts and departments, is secured and checked. See Figure 58.

In case the proof report is for a department in which both day and piece workers are employed, the total hours and amounts for the piece workers are entered in spaces allotted for that purpose by the time keeper, so that in the distribution of the day and piece workers' tickets by various accounts the grand total will check against the grand total that appears at the lower right hand side of the proof report.

After this operation is completed, the time tickets are filed in cabinet files behind their respective cost record cards and continue to accumulate day by day until the cost keeper receives notification, in the form of a box card which follows the job through the factory, that the job has been completed. The proof reports in the meantime are filed in a separate compartment, and the six cards for each department, covering one week, are recapitulated at the end of the week, in order to secure the weekly labor distribution by departments and accounts. Figure 58 shows proof reports for a week and Figure 59 shows a sheet on which these proof reports have been summarized, giving the total hours and amounts for department 5 and accounts 15, 10 and 22 for one week.

A
Cost
System

COST KEEPING SHORT CUTS

DAILY PROOF REPORT.			DEPT NO.	5	DATE	1/24
ACCOUNT NUMBER	HOURS	AMOUNT				
15	102 1/2	23 58	PRECEDING DAYS ALLOTMENT 152 34 09			

DAILY PROOF REPORT.			DEPT NO.	5	DATE	1/25
ACCOUNT NUMBER	HOURS	AMOUNT				
15	105	24 15	PRECEDING DAYS ALLOTMENT 152 34 09			

DAILY PROOF REPORT.			DEPT NO.	5	DATE	1/26
ACCOUNT NUMBER	HOURS	AMOUNT				
15	100	23 00	PRECEDING DAYS ALLOTMENT 142 1/4 32 09			

DAILY PROOF REPORT.			DEPT NO.	5	DATE	1/27
ACCOUNT NUMBER	HOURS	AMOUNT				
15	98 1/4	22 60	PRECEDING DAYS ALLOTMENT 142 1/4 32 09			

DAILY PROOF REPORT.			DEPT NO.	5	DATE	1/28
ACCOUNT NUMBER	HOURS	AMOUNT				
15	99	22 77	PRECEDING DAYS ALLOTMENT 152 34 09			

DAILY PROOF REPORT.			DEPT NO.	5	DATE	1/29
ACCOUNT NUMBER	HOURS	AMOUNT				
15	100	23 00	PRECEDING DAYS ALLOTMENT 152 34 09			
10	37 1/4	8 20	PLUS NEW EMPLOYEES 9 3/4 2 50			
22	24 1/2	5 39	MINUS EMPLOYEES QUIT			
PLUS OR MINUS CHANGES OF RATE						
PRESENT ALLOTMENT 161 3/4 36 59						
PLUS OVERTIME AND ALLOWANCE						
MINUS, ABSENT AND LATE						
TOTALS	161 3/4	36 59	PAY ROLL	161 3/4	36 59	
209834 Burroughs Adding Machine Co. Factory Form No. 27.						

Fig. 58

Daily Proof Reports for one week for Department 5

WEEKLY SUMMARY OF LABOR DISTRIBUTION						
FOR WEEK ENDING 11-7, 1909						
DEPT' AND ACCOUNT NO.:	DETAILS		ACCOUNT TOTALS		DEPARTMENT TOTALS	
	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT
5 15	102 1/2 105 100 98 1/4 99 100	23.58 24.15 23.00 22.60 22.77 23.00				
10	42 36 37 1/2 41 40 37 1/4	9.24 7.92 8.25 9.02 8.80 8.20	60 4 1/2	139.10*		
22	27 21 1/2 25 25 27 24 1/2	5.94 4.79 5.50 5.50 5.94 5.39	23 3 1/4	51.43*		
6 18	256 251 1/4 240 245 247 1/2 251	56.32 55.28 52.80 53.90 54.45 55.22	150 1/4	330.6*	98 8 1/4	223.59*
14	71 72 75 1/2 70 70 71	22.01 22.32 23.41 21.70 21.70 22.01	149 0 1/2	327.97*		
12	19 1/2 19 1/2 19 1/2 19 1/2 19 1/2 19 1/2	6.05 6.05 6.05 6.05 6.05 6.05	42 9 1/2	133.15*		
10	31 1/2 27 25 1/2 29 30 30	7.56 6.48 6.18 6.96 7.20 7.20	117	36.30*		
17	43 1/4 44 45 39 39 1/2 40	9.95 10.12 10.35 8.97 9.09 9.20	173 1/4	415.8*		
			250 1/4	576.8*	246 1/4	596.68*

Fig. 59

Miniature reproduction of a Weekly Summary of Labor Distribution prepared entirely with the Burroughs Adding Machine. The hours and amounts are added and listed simultaneously.

MONTHLY SUMMARY OF LABOR DISTRIBUTION

FOR 4 WEEKS ENDING 11-28, 1909

ACCOUNT AND DEPT NOS.	DETAILS		BURDEN	ACCOUNT TOTALS		TOTAL
	HOURS	AMOUNT		HOURS	AMOUNT	
155	604 1/4 610 615 1/4 631	13910 14640 14766 15144	\$			
10	114 7 121 4 1/2 133 1 1212	263.81 279.54 303.83 278.76	563.21	2461	584.60*	
22	37 5 1/2 410 39 8 1/4 360	11641 12710 12346 11160	1,105.30	4894 1/2	1,125.74*	
186	149 0 1/2 1456 1432 1/2 1488	327.97 320.32 315.15 327.36	367.18 2,035.69	1543 1/4 889.9 1/4	4785.74* 2,188.91*	4,224.60*
7	224 1 1/4 2260 219 8 1/2 2500	71720 72320 70360 80000	1,075.20	5867 1/4	1,290.80*	
9	1110 1113 1/2 1125 1/4 1142	244.20 244.97 247.56 251.24	2,731.10	9200	2,944.00*	
13	306 1/2 321 345 1/2 315	980.8 102.72 110.56 100.80	932.34	4490 1/2	987.97*	
16	561 1/2 550 571 1/4 569	174.07 170.50 177.24 176.39	395.60	1288	412.16*	
17	780 787 792 1/2 760	241.80 243.97 245.68 235.60	651.22	2252 1/4	698.20*	
20	2201 1/2 2231 2251 1/4 2260	484.33 490.82 495.28 497.20	921.30	3119 1/4	967.05*	
			1912.30 8,619.06	8943 1/4 35161 1/2	1,967.63* 9,267.81*	17,886.87*

Fig. 60

A Monthly Summary of Labor Distribution made with a Burroughs Adding Machine. The hours and amounts are added and listed simultaneously.

The summary sheet also includes labor distribution for department 6 and accounts 18, 14, 12, 10 and 17, which is taken from similar proof reports for department 6. At the end of the month the four weekly labor distribution summaries are recapitulated for the monthly summary in such a way that the monthly totals of labor distribution are shown for the various departments falling under the different accounts. Thus in Figure 60 the upper part of the sheet shows the labor distribution for account 15, which is the first item in the left hand column and is divided to cover Departments 5, 10 and 22. In this way we secure the total amounts of labor to be posted to the various accounts in the factory ledger. The posting is done once a month.

In addition to the labor distribution by accounts, we keep a record of the distribution to sub-accounts, as shown in Figure 61. In this case the account, No. 74-05, refers to the repairs on tools and dies for the screw machine department.

While the regular monthly distribution will show the total labor and burden to be charged to account 74, it does not analyze it sufficiently; hence the use of the sub-account distribution cards.

The sub-accounts for repairs are closed monthly and the time tickets, covering the labor for this purpose, are sorted first by accounts and then by sub-accounts, then by departments, and the total hours and total labor for each department are secured with the adding machine and posted on the card. Then from these cards the entries can be made to the sub-accounts in the factory ledger.

When a job has been completed all the time tickets, Figure 48, and material requisitions, Figure 62, referring to that job and which have been filed behind the cost record card, are first sorted by departments and then added and listed on the adding machine, securing the total labor cost for each department that has worked on the job.

Fig. 61
Operating Expense Sub-Accounts Card

ORDER NO.	4	SUPPLY REQUISITION.		DEP'T NO.	7
SYMBOL	166	DATE	7/28/10	ACC'T NO.	18
QUANTITY	DESCRIPTION	VALUE			
249#	1000 Castings @ .04 #	\$	9.96		
DELIVERED TO		DELIVERED BY	FOREMAN		
No.	753	No.	J. T.		

Fig. 62
Supply Requisition

COST KEEPING SHORT CUTS

B. A. M. CO. FCTRY FORM 381
BOX NO.:

COST RECORD

SYMBOL 1-400A#7 LOT NO. 6

DATE OF ORDER 2-5-10

NAME OF PART _____

STARTED IN 1A DEPARTMENT

QUANTITY	DESCRIPTION OF MATERIAL OR PARTS USED	AMOUNT
1	400 A #7	\$ 15 50
1	1-424 A.R.	23 86
1	1-424 A.L.	29 17
2	59	23 66
		<u>92 19</u>

NUMBER PARTS WANTED <u>700</u>	NUMBER PER BOX <u>175</u>	NUMBER PARTS TRANSF'D <u>4</u>	NO. PARTS FINISHED <u>696</u>
DATE DUE	NUMBER OF BOXES	NUMBER PARTS DESTROYED <u>4</u>	DATE REC'D FIN. STOCK <u>3-10-1911</u>

Fig. 63

SYMBOL & LOT NO. 6

LABOR & BURDEN COST 1-400A#7

DATE	DEPT	HOURS	LABOR	BURDEN	SUMMARY		
					DETAILS	ITEM	TOTAL
	1A	25 1/4	9 11	4 00			
	3	7	1 89	1 50	LABOR		20 80
	7	7	1 75	1 50			
27	25	8 05	4 10	BURDEN			11 10
				LESS ITEMS TRANSF'D F.O.			
				F.O.			
				F.O.			
				F.O.			
				MATERIAL			92 19
				Total			124 09
				UNIT COST	.178		

Fig. 64

A
Cost
System

These totals are then posted to the back of the cost record card, Figure 63, as shown in Figure 64, which in this instance is a cost record for a dash symbol. The

cost cards for straight and dash symbols are blue and white, respectively, in order that they may be easily distinguished.

The object of securing the total labor cost by departments is for the purpose of extending the burden, which varies according to the department.

After this burden has been extended, the total labor, material and burden are entered on the right hand side of the card and the grand total shows the cost of the job. Then by dividing this grand total by the number of parts turned out, the cost for the part is secured.

The number of parts and their cost having been secured in this manner, they are transferred to the cost keeper's record of finished stock, as shown in Figure 69. This record is kept by the cost keeper, in order that all finished parts may be charged out at their cost. The cost of parts often varies, according to the conditions under which they are manufactured, the market price of raw material, etc.

The stockkeeper also keeps a perpetual record of the finished stock, but does not record the cost, his record having to do with

	*
3.00	
.80	
6.00	
2.00	
4.00	
2.00	
3.00	
5.00	
3.00	
1.00	
2.00	
2.00	
33.80	*
	*
39.80	
2.00	
4.00	
6.00	
6.00	
4.00	
6.00	
6.00	
6.00	
79.80	S
99,966.20	
46.00	*

Fig. 65

quantity only, as shown in Figures 67 and 68. The card shown in Figure 67 is his record of what we call straight symbols, meaning those parts which are of one piece only, and the card shown in Figure 68 is the record for dash symbols, which are parts composed of two or more pieces combined.

In this connection attention should be called to the use of the adding machine for checking these records. Figures 65 and 66 show the actual adding machine work to check

completely the straight and dash symbol cards, respectively.

The method is as follows: Add the amounts delivered and take a total. Then add the balance on hand at the beginning of the period and the quantities received and take a sub-total. Then add the complement of the total amounts delivered and the remainder should agree with the last balance of the "In Stock" column. Since the items are carried over to the back of the cards, when the face has been filled, the machine is indispensable for securing a quick check on the last balance before carrying it over to the back of the card.

When a requisition is made on the finished stock room for straight symbols, the amount is entered on the finished stockkeeper's record and the requisition forwarded to the cost keeper, who enters the corresponding amount, together with the price, on his record.

	*
4 0 . 0 0	
4 0 . 0 0	
8 0 . 0 0	*
	*
4 0 . 2 0	
4 . 0 0	
1 2 . 0 0	
1 2 . 0 0	
8 . 0 0	
4 . 0 0	
8 . 0 0	
4 . 0 0	
8 . 0 0	
4 . 0 0	
8 . 0 0	
4 . 0 0	
4 . 0 0	
1 2 0 . 2 0	s
9 9 , 9 2 0 . 0 0	
4 0 . 2 0	*

Fig. 66

Fig. 67

DASH SYMBOL <u>1-368^A #9</u>											
CONSISTS OF											
1	368 ^a #9	1	362								
1	352 ^a	1	13362								
1	353 ^a	1	392								
HIGH MARK <u>4000</u>		ENTERS DASH									
LOW MARK <u>2000</u>		Assemb. in Final Inspec. Dept.									
AMOUNT USED IN FOLLOWING STYLES AND CONSTRUCTIONS:											
PCS.	STYLE	CONST.	PCS.	STYLE	CONST.	PCS.	STYLE	CONST.	PCS.	STYLE	CONST.
1	7	all									
1	9	all									
ORDERED				RECEIVED							
DATE	LOT	QUANTITY	LOT	PAN NO.	QUANTITY	SCRAPPED	DELIVERED				IN STOCK
1-11			<u>Inventory</u>								<u>3980</u>
10							300				<u>3680</u>
15							80				<u>3600</u>
20							600				<u>3000</u>
28							300				<u>2800</u>
2/10							400				<u>2400</u>
15							200				<u>2200</u>
20							300				<u>1900</u>
20	16	<u>4000 1 1/20</u>									
20							500				<u>1400</u>
25							300				<u>1100</u>
28							100				<u>1000</u>
3/1							200				<u>800</u>
5		<u>16 1/20</u>			<u>200</u>						<u>1000</u>
10		<u>16 3/4</u>			<u>400</u>						<u>1400</u>
11		<u>16 5/6</u>			<u>600</u>						<u>2000</u>
14		<u>16 7/9</u>			<u>600</u>						<u>2600</u>
15		<u>16 10/11</u>			<u>400</u>						<u>3000</u>
17							200				<u>2800</u>
18		<u>16 13/14</u>			<u>600</u>						<u>3400</u>
21		<u>16 15/17</u>			<u>600</u>						<u>4000</u>
22		<u>16 17/19</u>			<u>600</u>						<u>4600</u>

C O S T K E E P I N G S H O R T C U T S

RECORD OF FINISHED STOCK
SYMBOL /-400A STYLE 7

RECORD OF FINISHED STOCK

ACCOUNT NO.

ACCOUNT NO.

1404-5M 3-11-J. B. 4 S. COST DEPT -P, & S.

Fig. 69
Finished Stock Card

In the case of dash symbols the raw stockkeeper issues A Cost System these upon requisition, but it is not necessary to forward the requisition to the cost keeper, because the cost record card, covering the assembling of these dash symbols into sections, shows the number of dash symbols that are required for the job, together with the number of sections to be made, so that after the job has been completed he can make the proper deduction for the parts that make up the dash symbols from his stock record by making a simple calculation from data furnished by the cost card.

The cost keeper's stock records and those of the finished stockkeeper are checked against each other from time to time in order that no discrepancies may creep in.

For the purpose of illustrating more clearly several of the adding machine uses in connection with time tickets, Figures 70, 71 and 72 are shown.

Figure 70 shows five tickets, representing work that has been done in Department 18 and chargeable to Account 31. These constitute only a part of the total labor expended on a job, but show the amount expended on Symbol 416 in Department 18. Since Department 18 carries a rate of burden different from any other department working on Symbol 416, it is necessary to separate the tickets for this department into a group to themselves, and then add the labor hours to get the total. This addition is shown in the upper half of the adding machine example, the total being 22 hours. The burden rate per hour for this department is 17 cents. The 22 is then multiplied by the 17, as shown in the lower half of the example and the total burden, \$3.74, is secured.

Problems like this arise continually in our cost department and are handled with great speed and accuracy on the machine.

Figure 71 shows a group of five time tickets for day workers, the extensions of which are to be checked. The first ticket has 2 hours at 28 cents per hour and an earning

^{Cost}
^{System} A of 56 cents. This extension is checked as shown in the first problem at the right-hand side of the illustration by multiplying the 28 by 2 on the machine and pointing off two places by drawing a line with a pencil or pen.

The next ticket is checked in a similar manner, using 5.25 instead of $5\frac{1}{4}$ and pointing off the result four places.

A pile of tickets can be checked in this way, recording the results on the adding machine tape and afterwards reading back beginning at the top of the tape and with the first ticket.

Figure 72 shows five time tickets, the extensions of which are to be checked. In this case, however, the tickets are for piece workers and therefore the extensions result from multiplying rates per hundred by the number of pieces.

The same method is used as in Figure 71, the adding machine figures being checked back, after running off the extensions for a batch of tickets, one after another, on the tape.

These examples will give an idea of the immense amount of time and labor that can be saved in handling hundreds of tickets daily.

C O S T K E E P I N G S H O R T C U T S

TIME TICKET					DEPARTMENT NO. 18	DEPT. 18 *
WORKMAN'S NAME <i>Tinker</i>		DATE 1/10/10		WORKMAN'S NO. 1806		5%
ORDER NO. 4	SYMBOL 416	BOX NO. 3147	NO. PIECES 500	ACCOUNT NO. 31		2%
OPERATION 16		TIME 5 3/4	RATE 23		AMOUNT 1 32	4%
			HOURLY	HUNDRED	DOLLARS CENTS	4 1/2%
REMARKS						
TIME TICKET					DEPARTMENT NO. 18	TOTAL HOURS 2 2 *
WORKMAN'S NAME <i>Smith</i>		DATE 1/10/10		WORKMAN'S NO. 1807		2 2
ORDER NO. 4	SYMBOL 416	BOX NO. 1241	NO. PIECES 500	ACCOUNT NO. 31		2 2
OPERATION 16		TIME 2 3/4	RATE 23		AMOUNT 63	2 2
			HOURLY	HUNDRED	DOLLARS CENTS	2 2 0
REMARKS						
TIME TICKET					DEPARTMENT NO. 18	BURDEN 3.74 *
WORKMAN'S NAME <i>Wilkes</i>		DATE 1/10/10		WORKMAN'S NO. 1812		2 2
ORDER NO. 4	SYMBOL 416	BOX NO. 3120	NO. PIECES 500	ACCOUNT NO. 31		2 2
OPERATION 16		TIME 4 3/4	RATE 23		AMOUNT 1 09	2 2
			HOURLY	HUNDRED	DOLLARS CENTS	
REMARKS						
TIME TICKET					DEPARTMENT NO. 18	
WORKMAN'S NAME <i>Tinker</i>		DATE 1/10/10		WORKMAN'S NO. 1830		
ORDER NO. 4	SYMBOL 416	BOX NO. 316	NO. PIECES 500	ACCOUNT NO. 31		
OPERATION 16		TIME 4 1/2	RATE 23		AMOUNT 1 04	
			HOURLY	HUNDRED	DOLLARS CENTS	
REMARKS						
TIME TICKET					DEPARTMENT NO. 18	
WORKMAN'S NAME <i>Jones</i>		DATE 1/10/10		WORKMAN'S NO. 1804		
ORDER NO. 4	SYMBOL 416	BOX NO. 2131	NO. PIECES 500	ACCOUNT NO. 31		
OPERATION 16		TIME 4 1/4	RATE 23		AMOUNT 98	
			HOURLY	HUNDRED	DOLLARS CENTS	
REMARKS						
TIME STARTED 9 1/4			TIME FINISHED 2 1/2			
FOREMAN'S O. K. <i>J.W.L.</i>						
4 & 5 M. 992104 SURVEYING AND MACHINING MACHINE CO. FACTORY FORM NO. 278						

Fig. 70. Five Time Tickets for Account 31, together with adding machine list of workmen's earnings and calculation of burden.

C O S T K E E P I N G S H O R T C U T S

TIME TICKET			DEPARTMENT NO. 1a	
WORKMAN'S NAME		DATE		WORKMAN'S NO.
Gessert		1/7/10		1
ORDER NO.	SYMBOL	BOX NO.	NO. PIECES	ACCOUNT NO.
1	2-600 A #9		28	31
OPERATION		TIME	RATE	
3		7	28	56
			HOURLY	MINUTES
			DELLAR	CENTS

Deft 1+ a
Workman 1+

.28

.28

56*

55*

5.250

5.250

105.00*

.76*

22.50

22.50

45.00*

.88*

9.75

9.75

9.75

9.75

9.75

9.75

9.75

9.75

9.75

9.75

9.75

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9.75

9.75

9.75

9.75

9.75

9.75

263.25*

.64*

4.75

4.75

47.50

47.50

104.50*

TIME TICKET			DEPARTMENT NO. 1a	
WORKMAN'S NAME		DATE		WORKMAN'S NO.
Trucker		1/7/10		76
ORDER NO.	SYMBOL	BOX NO.	NO. PIECES	ACCOUNT NO.
8	765a #7	6872	180 80	31
OPERATION		TIME	RATE	
70-76		9 1/4	27	2.63
			HOURLY	MINUTES
			DELLAR	CENTS

TIME TICKET			DEPARTMENT NO. 1a	
WORKMAN'S NAME		DATE		WORKMAN'S NO.
Jones		1/7/10		64
ORDER NO.	SYMBOL	BOX NO.	NO. PIECES	ACCOUNT NO.
7	682		18000	31
OPERATION		TIME	RATE	
32 - 23		4 3/4	22	1.05
			HOURLY	MINUTES
			DELLAR	CENTS
TIME STARTED 7:00 TIME FINISHED 11:45				
FOREMAN'S O. K. <i>Kelpatrick</i>				

Fig. 71

Five Time Tickets for Department No. 1a and Adding Machine slip showing multiplication of time and rate in checking the earning of each workman.

COST KEEPING SHORT CUTS

TIME TICKET				
WORKMAN'S NAME		DEPARTMENT NO. 27		
Smith		DATE	WORKMAN'S NO.	
DROER NO.	SYMBOL	BOX NO.	NO. PIECES	ACCOUNT NO.
1	2-910 B.R.	10360	380	31

OPERATION		TIME	RATE	AMOUNT
68	26-54 for 953	6 1/2	.45	1.71

Dept 27
Workman 2766*

3.80
3.80
3.80
3.80
3.80
3.80
3.80
3.80
3.80
3.80

1/7100*

27.61*

22.00
22.00
22.00
22.00
22.00

11000*

27.62*

12.00
12.00
12.00
12.00
12.00
12.00

12000*

18000*

27.68*

4.92
4.92
4.92
4.92
4.92
4.92
4.920
4.920

12300*

27.67*

5.000
5.000
5.000
5.000

20000*

TIME TICKET				
WORKMAN'S NAME		DEPARTMENT NO. 27		
Brady		DATE	WORKMAN'S NO.	
DROER NO.	SYMBOL	BOX NO.	NO. PIECES	ACCOUNT NO.
6	1807 H	121	220	31

OPERATION		TIME	RATE	AMOUNT
74		3 3/4	.50	1.75

1/7100*

27.61*

22.00
22.00
22.00
22.00
22.00

11000*

27.62*

12.00
12.00
12.00
12.00
12.00
12.00

12000*

18000*

27.68*

4.92
4.92
4.92
4.92
4.92
4.92
4.920
4.920

TIME TICKET				
WORKMAN'S NAME		DEPARTMENT NO. 27		
Brown		DATE	WORKMAN'S NO.	
DROER NO.	SYMBOL	BOX NO.	NO. PIECES	ACCOUNT NO.
7	665 #13	9006	120	31

OPERATION		TIME	RATE	AMOUNT
26-54	60Y - 26	6 3/4	.50	1.80

13606 - 13710 - 680-8

OPERATION		TIME	RATE	AMOUNT
54-900	26-54-953	4	.25	1.25

TIME TICKET				
WORKMAN'S NAME		DEPARTMENT NO. 27		
Shatto		DATE	WORKMAN'S NO.	
DROER NO.	SYMBOL	BOX NO.	NO. PIECES	ACCOUNT NO.
1	1-910 R	13041	492	31

OPERATION		TIME	RATE	AMOUNT
54-900	26-54-953	4	.25	1.25

TIME TICKET

WORKMAN'S NAME		DEPARTMENT NO. 27		
----------------	--	-------------------	--	--

Haines

DROER NO.	SYMBOL	BOX NO.	NO. PIECES	ACCOUNT NO.
1	2800 #7	6754	50	31

OPERATION		TIME	RATE	AMOUNT
76	1-816 C	6 1/4	.40	2.40

TIME TICKET

WORKMAN'S NAME		DEPARTMENT NO. 27		
----------------	--	-------------------	--	--

Beale

TIME STARTED		TIME FINISHED		
--------------	--	---------------	--	--

7:45

3:00

FORCERMAN'S N/K.

Beale

REG. NO. 222166

WILCOX ADDING MACHINE CO. FACTORY PRICE NO. 200

Fig. 72

Five Time Tickets for Department No. 27 and Adding Machine slip showing the multiplication of the number of parts by the rate per hundred in checking the earning of each workman.

CHAPTER XX

Information for the General Manager

Valuable Data

THE following forms illustrate valuable data that is collected and tabulated by the adding machine.

This information is very instructive for the management and is brought together in a way that enables the manager of a plant to gather, at a glance, the status of his business, both regarding costs and sales.

The sheet illustrated in Figure 73 shows how a monthly summary of materials charged to various accounts can be recapitulated on the Burroughs Machine. This is secured by sorting every week all material requisitions on completed jobs by accounts and recapitulating them on the machine. By using a Duplex Machine the totals for each account and the grand total for all accounts are obtained at one run.

The facsimile sheet in Figure 74 is a Cost of Production Report that is collected from data furnished by the cost department. The amounts are fictitious but illustrate the principle. They show the number of various kinds of machines manufactured during the month, their cost and the average cost per machine. A glance at this sheet gives as much information as an hour's study of a detailed cost record.

The illustration in Figure 75 is a comparative statement of sales. The amounts are fictitious but the sheet, when made up of actual figures, shows the number of hand machines made, the styles, value, cost and profit on each style, both for the current month and for the corresponding period the previous year.

A statement of this kind is easily prepared on the adding machine and furnishes valuable data to the management. It is a growth indicator that can be read in a

REPORT OF RAW MATERIALS AND SUPPLIES USED

STORES FOR 4 WEEKS ENDING, 11-28, 1909

ACCOUNT NO.	WEEK ENDING 11-7	WEEK ENDING 11-14	WEEK ENDING 11-21	WEEK ENDING 11-28	WEEK ENDING	TOTAL	P&T& REF.
1	15356	16345	16867	13456		62024*	*
2	43006	42400	40000	52340		177746*	
3	13460	16000	19467	10456		59383*	
4	15606	18607	10305	16666		61184*	
5	5067	8405	7357	1203		22032*	
6	76607	73450	73678	74560		298295*	
7	32035	22050	40035	10450		104570*	
8	44660	50000	47450	26445		168555*	
9	36566	37407	26405	41024		141402*	
10	15788	10457	14678	18089		59012*	
11	7800	8000	9056	6609		31465*	
12	10000	10340	10455	14460		45255*	
13	7566	8068	7556	2045		25235*	
14	36566	41130	25570	26445		129711*	
15	53450	40678	20245	23356		1,377.29*	
16	2400	12067	14.72	1135		170.74*	
17	17457	27506	14444	17057		76464*	
18	9770	8778	7890	10205		36643*	
19	24460	29950	28667	28776		1,118.53*	
20	28767	29000	23450	23344		1,045.61*	
21	13550	18450	17056	13460		62516*	
22	54560	58805	53356	53350		2,200.71*	
23	20456	30205	20405	40246		1,113.12*	
24	20220	25677	24670	24566		95133*	
25	12250	16688	13635	12205		54778*	
	5,174.23*	6,604.63*	5,741.69*	5,619.48*		24,140.03*	

Fig. 73

Report of Raw Materials and Supplies prepared with a Burroughs Adding Machine.

COST OF PRODUCTION					
MACHINES MANUFACTURED		MONTH ENDING 11-30, 1909			
STYLE AND CONSTRUCTION	QUANTITY	COST	COST PER MACHINE		
			MONTH	YEAR	MINIMUM
6--X	.12	1,106.64	92.22	91.30	90.04
6--H	.14	1,824.90	130.35	129.31	127.07
6--H	.12	1,803.96	150.33	152.46	150.44
7--H	.21	2,786.07	132.67	133.00	131.25
7--G	.20	3,248.80	162.44	165.35	162.07
7--H	.14	2,273.04	162.36	160.86	159.09
7--H-El.	.22	4,343.68	197.44	198.55	196.50
9--N	.15	2,785.95	185.73	184.46	183.20
9--N-El.	.15	3,470.70	231.38	230.31	228.33
9--G	1.87	36,001.24	192.52	296.51	191.30
9--G-El.	2.06	48,226.66	234.11	235.17	232.04
9--H	2.35	45,366.75	193.05	195.52	190.24
9--S&N-El.	1.96	46,455.93	237.02	237.33	231.04
9--H-El.	2.40	54,266.40	226.11	225.16	220.06
9--K	.75	16,584.75	221.13	222.77	218.33
9--K-El.	.30	7,532.70	251.09	250.12	247.06
9--S&N-K-El.	.12	3,254.76	271.23	272.41	270.13
.11--H	1.46	32,539.02	222.87	222.47	220.04
.11--S&N-H	.48	9,723.00	231.50	232.14	231.03
.11--H-El.	.31	8,718.75	281.25	284.51	280.30
.13--H	.12	2,796.36	233.03	233.66	231.12
.13--H-El.	.4	1,128.48	282.12	285.75	280.23
.15--S&N-H	.92	25,392.00	276.00	273.13	270.04
.15--S&N-H-El.	1.63	47,612.30	292.10	290.13	285.50
.15--S&N-K-El.	.95	31,445.95	331.01	332.14	328.22
.15--VS-H-El.	.42	13,122.90	312.45	310.66	307.04
.15--VS-K-El.	.17	5,644.34	332.02	332.28	330.05
.15--H-ACT-El.	.16	5,459.52	341.22	341.40	340.56
.15--H-Shut-El.	.14	4,664.10	333.15	330.02	328.24
	20.00*	469,579.64*			

Fig. 74

Production Cost Report made on the Burroughs Adding Machine.
The descriptions are written with a typewriter.

MANO	COMPARATIVE STATEMENT OF SALES							
	CURRENT MONTH -				CORRESPONDING PERIOD LAST YEAR			
	SALES		COST OF SALES	PROFIT	SALES		COST OF SALES	PROFIT
	QUANTITY	VALUE			QUANTITY	VALUE		
3	17	3,825.35	3,173.12	652.23	*	*	*	*
4	14	2,663.55	2,142.35	521.20				
6-II	22	5,524.55	4,524.55	1,000.00	20	4,504.40	3,782.94	721.46
6-12 ¹	21	5,256.00	4,134.60	1,121.40	18	3,460.32	2,827.07	633.25
7-II	32	8,834.50	7,362.25	1,472.25	25	6,255.75	5,132.75	1,123.00
7-12 ¹	35	10,534.50	8,534.34	2,000.16	27	5,756.21	5,643.88	111.23
9-10	17.5	6,813.40	5,441.26	1,372.14	145	39,947.50	34,582.95	5,364.55
9-12 ¹	13.2	4,952.45	4,191.20	761.24	125	37,543.75	32,409.20	5,134.55
9-12 ¹ -SH	125	50,245.00	41,282.59	8,962.41	112	42,650.40	34,715.85	7,334.55
9-18-SH	145	58,020.55	45,879.30	12,141.25	120	48,282.00	40,337.45	7,944.55
11-12 ¹	16	6,805.75	5,840.55	965.20	12	4,844.50	4,059.95	784.55
11-12 ¹ -SH	31	13,143.25	11,421.83	1,721.42	22	9,362.10	8,016.70	1,345.40
11-12 ¹ -Sht	12	5,405.05	4,617.38	787.67	10	4,225.00	3,466.34	758.66
13-12 ¹	8	3,803.45	3,269.25	534.20	6	2,702.04	2,188.60	513.44
13-12 ¹ -Sht	22	9,925.00	8,200.70	1,724.30	12	5,704.08	4,659.58	1,044.50
15-12 ¹ -SH	113	46,175.00	43,054.83	3,120.17	102	45,944.88	38,589.38	7,353.50
15-18-SH	25	12,502.05	10,602.05	1,900.00	23	10,932.82	9,298.37	1,634.45
15-12 ¹ -Sht	36	18,352.50	16,188.27	2,134.23	29	10,456.46	9,336.06	1,120.40
15-12 ¹ -VS	35	19,233.50	16,993.15	2,240.35	31	16,281.82	13,646.38	2,633.44
15-18-VS	25	14,306.55	12,366.45	1,940.10	24	13,640.16	11,537.86	2,102.30
15-12 ¹ -ACT	8	4,244.00	3,283.58	960.42				
15-12 ¹ -Sht	4	2,346.50	1,764.08	582.42				
	1052*	41,877.510*	35,095.991*	6,781.519*	863*	31,289.419*	26,423.331*	4,866.086*

Fig. 75

This Comparative Statement of Sales is a valuable index to the growth of the business. All except the description is tabulated with the Burroughs.

COMPARATIVE STATEMENT OF EARNINGS

MONTH ENDING 11-30, 1909

PARTICULARS	CURRENT MONTH		COR. PERIOD LAST YEAR		JAN. 1, '09, TO DATE	
	AMOUNT	5 TO BALD	AMOUNT	5 TO BALD	AMOUNT	5 TO BALD
<u>Gross Mfg. Profit:</u>	*		*		*	
Regular Machines	115,467.25		102,416.25		1,121,406.50	
Special Machines	82,315.17		73,200.15		875,452.65	
Paper & Ribbon	2,247.25		2,032.05		26,301.40	
Machine Parts	4,668.50		3,111.40		46,321.20	
Repairs	2,162.50		1,862.47		22,165.07	
Total	206,860.67*		182,622.32*		2,091,646.82*	
Deduct loss on Stands	725.40*		620.25*		7,000.25*	
<u>Gross Earnings</u>	<u>206,135.27*</u>		<u>182,002.07*</u>		<u>2,091,646.82*</u>	
Deduct Expenses	*		*		*	
Selling & Distributing	77,567.20		69,460.22		79,451.20	
General & Administrative	24,300.28		18,761.50		251,200.05	
Machines under Guarantee	4,250.55		3,721.20		414,06.23	
Machines Dismantled	1,260.27		1,007.60		12,687.79	
Total Expenses	107,378.24*		92,950.52*		1,084,745.27*	
<u>Net Earnings from operations.</u>	<u>98,757.03*</u>		<u>89,051.55*</u>		<u>1,006,901.55*</u>	

Fig. 76

Comparative Statement of Earnings made with an adding machine
and a typewriter.

**COMPARATIVE STATEMENT
OF SELLING AND DISTRIBUTING EXPENSES**

PARTICULARS	TOTAL CURRENT MONTH		COR. PERIOD LAST YEAR		JAN. 1 TO DATE	
	AMOUNT	% TO SALES	AMOUNT	% TO SALES	AMOUNT	% TO SALES
<u>COMMISSIONS</u>		*		*		*
Machine Sales	110,465.50		99,243.45		1,002,324.45	
Rebuilt Sales	17,320.40		15,335.34		15,345.24	
Foreign Sales	16,462.00		12,030.50		15,823.05	
Machine Rentals	7,624.00		7,224.4		7,335.00	
<u>SALARIES</u>	22,432.45		21,165.34		21,462.35	
<u>MACHINE REPAIRS</u>	9,256.40		7,944.50		8,945.23	
<u>FREIGHT & EXPRESS</u>	5,875.78		4,933.35		6,234.50	
<u>DUTY</u>						
On Machines	624.40		1,254.30		4,123.45	
On Printg & Stany	152.20		75.00		1,423.40	
On Repair Parts	375.80		88.22		2,250.30	
<u>PRINTING and STATIONERY</u>	1,600.00		1,422.00		1,534.50	
<u>OFFICE SUPPLIES</u>	892.75		750.00		7,503.40	
<u>POSTAGE</u>	1,431.22		1,243.45		13,523.44	
<u>TELEGRAPH etc.</u>	290.15		243.56		1,845.00	
<u>TRAVELING EXP.</u>	1,241.75		1,053.55		10,112.00	
<u>TAXES & INS</u>	1,875.27		1,786.00		18,555.33	
<u>ADVERTISING</u>	4,275.40		3,423.40		4,523.05	
<u>HALF TONES etc.</u>	532.20		486.66		4,245.65	
<u>CONVENTIONS</u>	691.30		822.30		5,220.50	
<u>SALESMEN'S SCHOOL</u>	436.50		521.30		2,744.50	
<u>MAGAZINES</u>	47.25		45.00		522.00	
<u>SALESMEN'S PRIZES</u>	633.40		422.30		6,345.50	
<u>STROEPTICAN</u>	78.55		50.00		734.50	
<u>MISCELLANEOUS</u>	421.34		252.45		3,503.45	
 TOTALS	198,174.41*		175,314.41*		1,868,102.17*	

Fig. 77

Another machine-made statement that is exceedingly valuable to the management.

INVENTORIES

DETAILS	MONTH ENDING		COR. PERIOD LAST YEAR		AS AT DEC. 31, 1908.	
	QUANTITY	VALUE	QUANTITY	VALUE	QUANTITY	VALUE
Factory Style 3	.20	3,446.20	.16	2,756.96	.17	2,929.27
" 4	.16	2,485.12	.13	2,019.16	.14	2,174.48
" 6	.18	2,958.12	.15	2,465.10	.16	2,629.44
" 6	.19	3,273.89	.20	3,446.20	.21	3,618.51
" 7	.22	4,147.00	.20	3,770.00	.21	3,958.50
" 7	.21	3,677.31	.16	2,801.76	.17	2,976.87
" 9	.74	18,948.42	.55	14,098.15	.63	16,148.79
" 11	.31	8,910.33	.30	8,622.90	.32	9,197.76
" 13	.12	3,196.80	.12	3,196.80	.15	3,996.00
" 15	.46	1,3901.66	.33	9,972.93	.42	12,692.82
Total Factory	2.79*	64,964.85*	2.30*	53,149.96*	2.58*	60,322.44*
Agencies Style 3	4.97	85,638.07	3.88	66,856.28	3.92	67,545.52
" 4	2.85	4,426.620	2.50	3,883.00	2.46	3,820.872
" 6	4.40	72,309.60	3.76	61,791.84	3.61	62,613.54
" 6	4.35	74,954.85	3.23	55,656.13	3.30	56,862.30
" 7	17.60	331,760.00	16.66	314,041.00	17.22	324,597.00
" 7	18.75	328,351.25	17.67	309,419.37	18.11	317,124.21
" 9	40.42	103,608.86	38.87	99,635.471	38.44	98,533.25
" 11	11.35	32,623.305	12.44	35,756.292	13.22	37,998.246
" 13	3.70	9,856.80	3.77	10,043.280	4.11	10,949.040
" 15	18.66	56,392.386	16.33	49,350.893	14.55	43,971.555
Total Agencies	127.05*	2,962,070.74*	119.11*	2,794,453.98*	119.14*	2,781,472.22*
Models	.63	19,752.25	.51	15,612.00	.55	16,013.50
Finished Parts		160,052.00		155,214.12		157,333.25
Work in Process		15,320.125		14,762.130		15,122.350
Raw Stock & Sup.		14,132.650		13,540.625		13,602.422
Small Tools etc.		1,5355.75		1,422.150		1,501.000
Paper & Ribbons		2,430.212		2,012.140		2,012.220
Scrap		1,875.50		1,250.00		1,311.33
Total		49,611.312*		47,383.457*		48,091.450*
Grand Total	304.7*	3,542,900.96*	121.92*	3,337,050.51*	122.27*	3,338,722.66*

Fig. 78

The quantity and price of the numerous items going into the inventory can be quickly and accurately recorded with the Burroughs Adding Machine.

very few minutes. If the growth is healthy, well and good, A but if there is a dropping off in any line, it is shown up ^{Cost} System immediately.

Figure 76 is a comparative statement of earnings, which, for obvious reasons, contains fictitious amounts. It is in the nature of a general recapitulation and is comparative, showing the results for the current month and same month the previous year.

The comparative statement of Selling and Distributing Expenses in Figure 77 is a general summary of ^{sons} expenses of all kinds for the year to date, the current month and the corresponding month the previous year.

The monthly inventory of machines in Figure 78 shows the quantity of the different styles on hand, both in the factory and in the agencies, together with the value. The same information is also given regarding the inventory for the corresponding month the previous year, and the number and value of machines in factory and agencies at the end of the previous year.

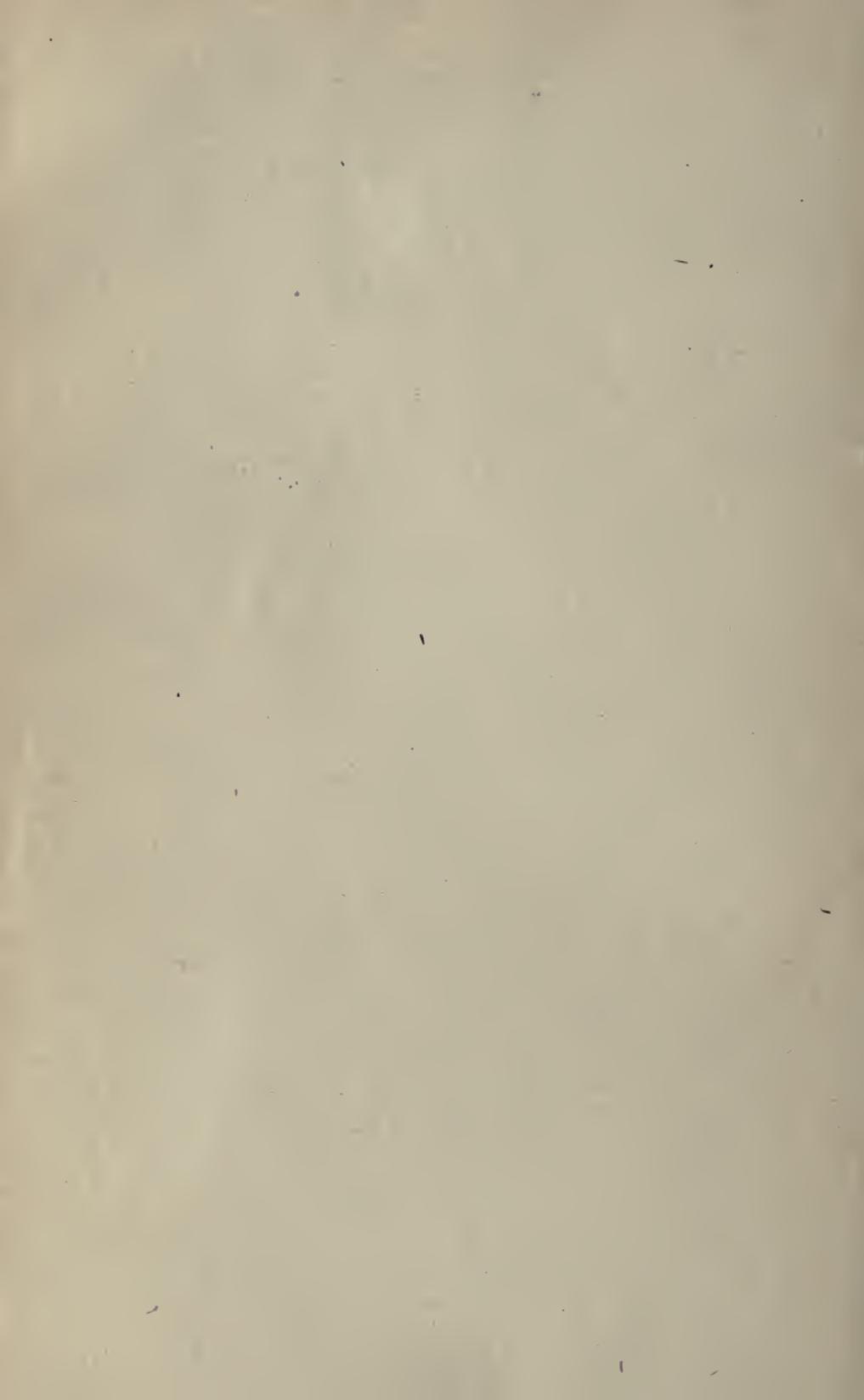
This record is a handy guide for the distribution of machines between factory and agencies, as well as a comparative record of this distribution.

Such records are valuable to us and emphasize the fact that with an adding machine it is possible to prepare statistics of this nature with very little extra expenditure of time and labor.

Any manufacturer would like to have similar information about his business, but deprives himself of it because he thinks it costs too much, and his conclusions are correct unless he is operating an adequate cost system.

A cost system of the right kind, however, automatically produces the vital information so that the preparation of summaries and comparative statements of costs, etc., is merely a recapitulation and tabulation of the items with a machine.

A When a machine handles the details, it is possible to
Cost System operate a cost system at far less cost than the value of the
information given. Without a machine this is practically
impossible.



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